WIRE AND WIRE PRODUCTS

MARCH, 1961

BIG
—for big coils
and big
production

VAUGHN
HORIZONTAL
STATIONARY
BLOCK

42" Diameter Block
4000 lb. Coils
Back-Geared no hook needed to hold horse
Water Cooled

THE VAUGHN MACHINERY COMPANY
Cuyahoga Falls, Ohio, U.S.A.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

COULTER & McKENZIE

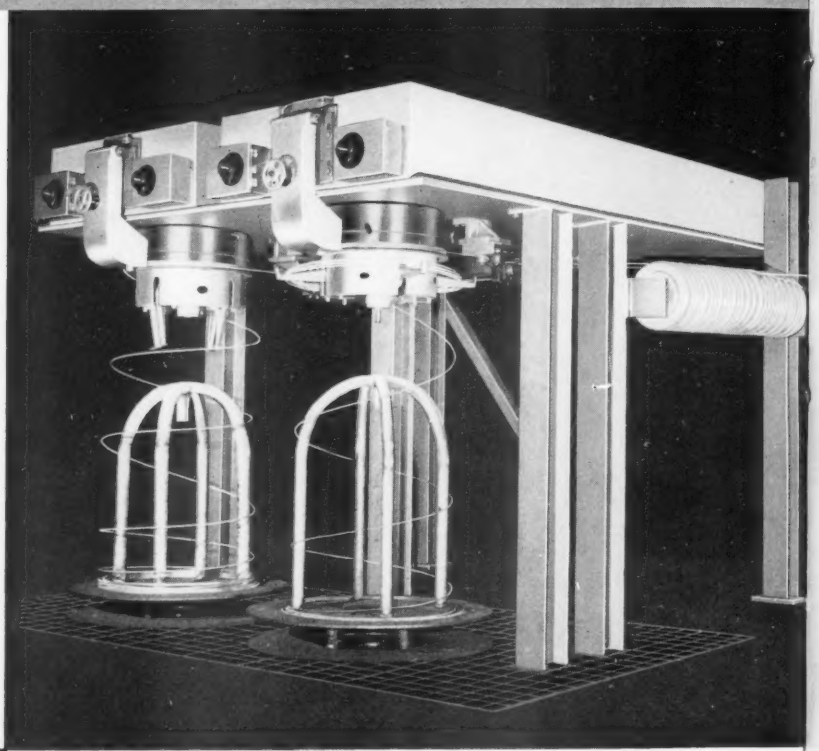
ANNOUNCES THE WIRE INDUSTRY'S MOST VERSATILE TAKE-UP & WIRE PACKAGING MACHINE!

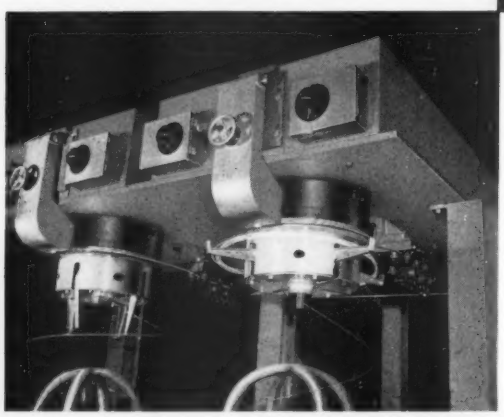
Vari-Coil

For PATENTING
ANNEALING
GALVANIZING
ENAMELING
TINNING
FINAL DRAW

- √ Non-Stop Package Changing
- √ Package Sizes to 4,000 lbs.
- √ Coil Diameters to 36″
- √ Speeds Infinitely Variable
- √ Wire Size to ⅜″ (.375″)
- √ Ferrous and Non-Ferrous Materials Including High Carbon Steel

THERE IS A SIZE FOR ALL APPLICATIONS. SINGLE OR MULTIPLE UNITS FOR YOUR INDIVIDUAL JOB.





For information concerning your application, please write or telephone.

1 INFINITELY VARIABLE RANGE OF COIL SIZES
a. All sizes wire from same capstan.
b. Current models with coil ranges 16″ to 26″ and 24″ to 36″ without changing blocks.
c. Coil sizes may be altered without stopping.

2 GREATER COIL WEIGHTS
a. Turn tables accommodate coils, drum paks and stems (200 to 1200 lbs.)
b. Oversize loads on handling pallets (1000 to 4000 lbs.)

3 INCREASED RANGE OF WIRE AND ROD SIZES
a. Precise cast control of fine wire to coarse rod.
b. No axial twist.

4 ACCUMULATOR HEAD PROVIDES INTERVAL FOR STRIPPING AT OPERATOR'S CONVENIENCE
a. Accumulator operating in conjunction with main take-up block is key to uninterrupted constant speed take-up.
b. Operator has 5 to 10 minutes accumulation time for stripping finished package from turn table.

This equipment manufactured under one of the following U. S. Patents 2,732,060; 2,868,474; 2,844,416; 2,868,268 or others pending.

Barron & Crowther Ltd., Eastleigh, Hants, England. European Draw-Pak Licensee Idos Industries Ltd., Royston, Herts, England, Sales Agents.

35 UNION AVENUE

TELEPHONE EDISON 5-1101
LIEBER'S CODE "MACKENZIE"

THE COULTER & McKENZIE MACHINE CO., INC.

SINCE 1942 BRIDGEPORT 7 CONNECTICUT U. S. A.

The best Medicine

can't cure your problem...

if you don't use it. If you have greater efficiency in mind you will find our new products to be the answer!

AQUALUBE 268

COLOR-IDENTIFIED, WATER-SOLUBLE. FOR DRAWING COPPER TUBING AND COPPER WIRE. PERFECT SOAP/FAT BALANCE.

AQUALUBE 269

COLOR-IDENTIFIED LUBRICANT. REPORTED TO PERFORM EXCELLENTLY IN DRAWING STAINLESS TUBING FOR USE IN NUCLEAR REACTORS.

WIRE DRAW NO. 788

POWDER LUBRICANT FOR NAIL WIRE STOCK. BETTER DRAWING, CUTTING AND CLEANING. RUST PROTECTION DURING WAREHOUSING.

BC-ADDITIVE

NON-PREFERENTIAL ADDITIVE TO BORAX COATING SOLUTIONS. EXCELLENT WETTING, IMPROVED DRAWING, REDUCED SLUDGING.

"LOOK TO STANDARD FOR THE FUTURE"

Standard Industrial

COMPOUNDS CO., INC.

Member WAS

FRANKFORT, ILLINOIS

(A suburban Chicago area city)
Telephones: 2131 - 2141

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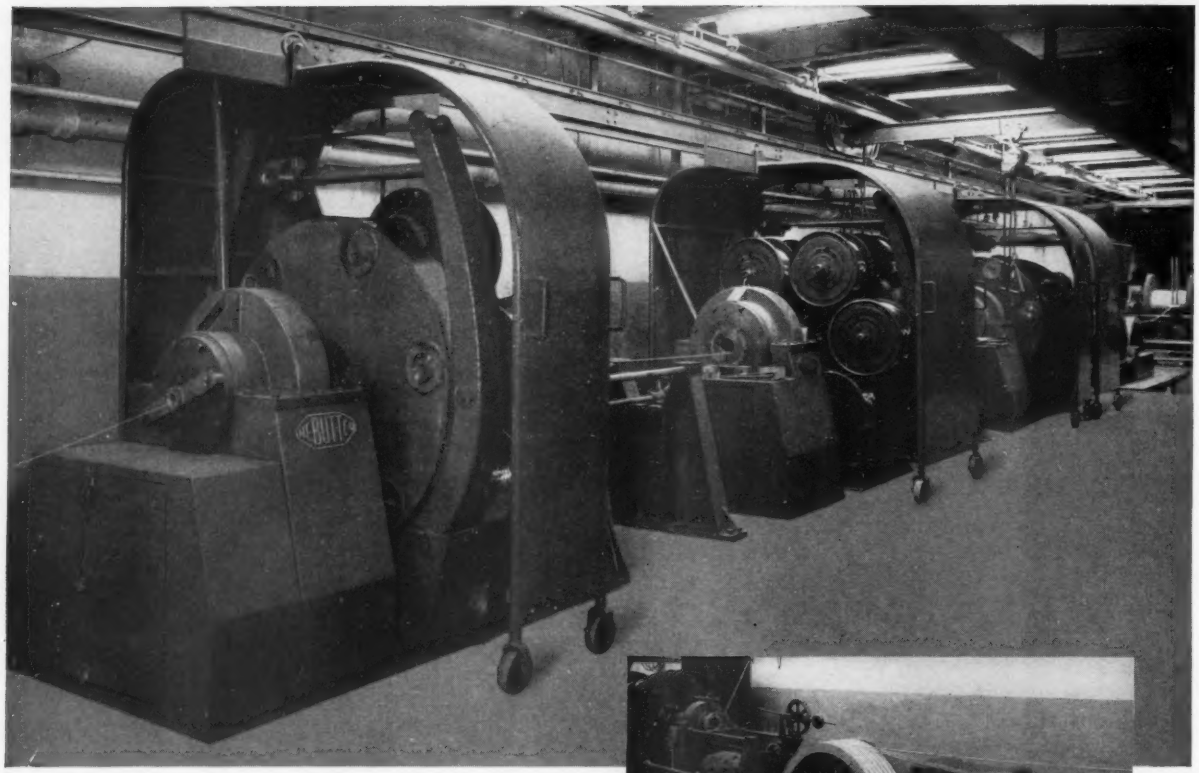
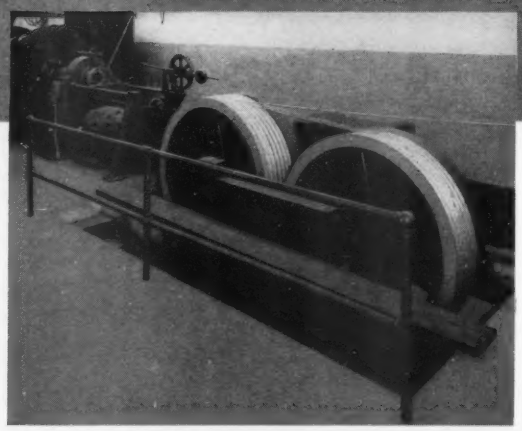
Gran Via No. 4, Bilboa, Spain.

Canadian Manufacturer:
H. L. Blachford Ltd., 977 Aqueduct St., Montreal, Que.
H. L. Blachford Ltd., 40 Titan Rd., Toronto, Ont.

Standard Industrial has pioneered in most of the outstanding contributions to better wire drawing through better lubricants. Consult Standard Industrial for the solution of your difficult problems.





60" multi-groove capstans tilted for straight pull on cable without chafing. Both capstans are driven.

NEBUTTCO

RIGID STRANDER

Engineered with more than a century's manufacturing experience and ruggedly built for continuous, profitable operation, this high speed Strander requires minimum maintenance and produces high quality, uniform cables. All gearing is enclosed and guards are furnished as shown. The Strander is provided throughout with anti-friction bearings.

This machine has a capacity up to 37 wires and is supplied with 6, 12, and 18-reel heads. Any combination of spool heads can be supplied. Reels 22" diameter x 11" traverse are accommodated. Each head can be run independently in either direction or all heads can be run in unison in either direction at speeds up to 100 rpm. A speed of 120 rpm can be maintained on the 6-reel head. (150 rpm for aluminum).

For complete information and prices, contact New England Butt Company, Division Wanskuck Company, 304 Pearl Street,, Providence 7, R. I. or James Day (Machinery) Ltd., 28 Maddox Street, London W-1, England.

NEBUTTCO

BRAIDERS
CABLERS · TAKE-UPS
BUNCHERS · STRANDERS
TAPING MACHINES

Increase COLOR CODING OUTPUT

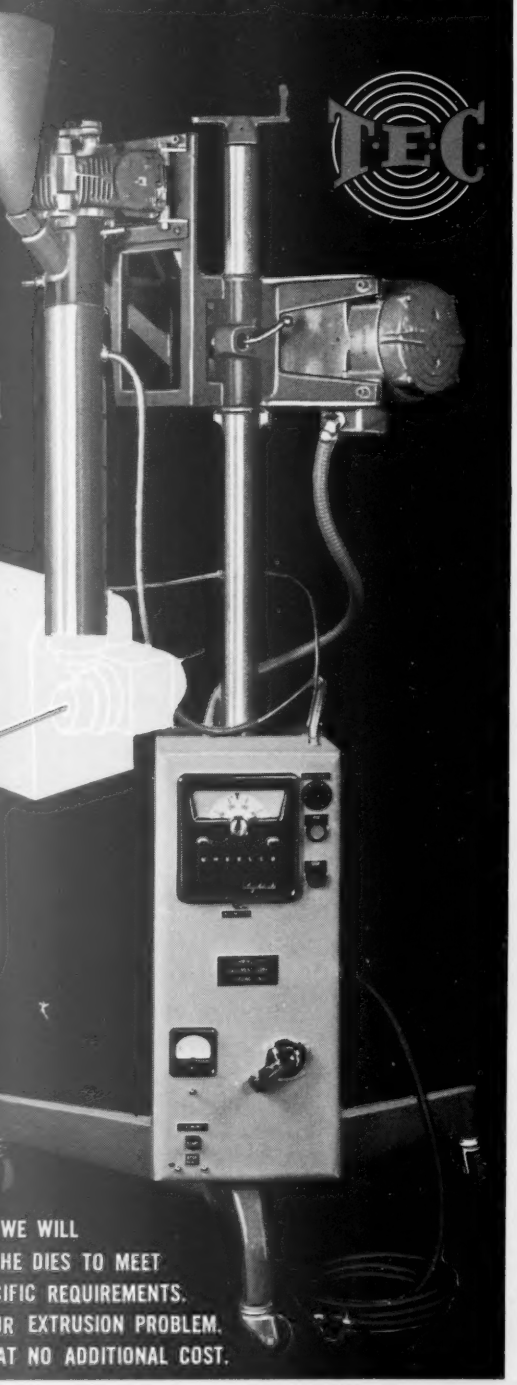
with the

Model 1250-20

LONG BARREL

VERTICAL EXTRUDER

T·E·C



Wire manufacturers with a coating problem will find the solution in this new vertical extruder.

This unit is complete and ready to run. It is designed to give you maximum versatility in operation. By means of a height adjustment and rotation of the top part, any setup job becomes routine.

The Model 1250-20 can be combined, in tandem, with any standard extruder in operations such as adding contrasting stripes or full color coating to insulation wire.

20:1 L/D Ratio
30-40 lbs./HR
Nominal Output

SIMULTANEOUS EXTRUSION OF DIFFERENT COLOR MATERIALS for:

- *Striping Indentification*
- *Color Coating*
- *Wire Insulation*

WE WILL
MAKE THE DIES TO MEET
YOUR SPECIFIC REQUIREMENTS.
LET US KNOW YOUR EXTRUSION PROBLEM.
WE WILL SOLVE IT AT NO ADDITIONAL COST.

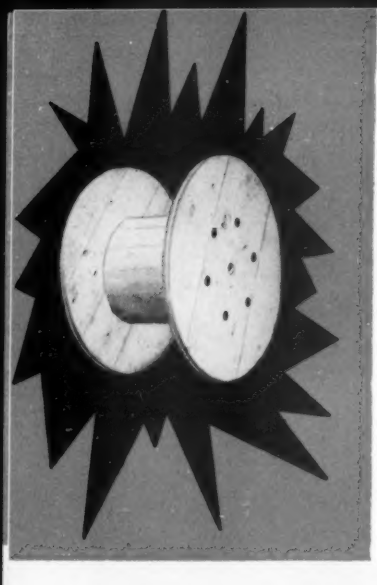
Write for Catalog and Complete Information

Designers and Builders of Specialized Equipment for the Extrusion Industry

Thermoplastic Equipment Corporation

Division of THERMOPLASTIC PROCESSES, INC. VALLEY ROAD • STIRLING, N. J.

Mitchell 3-4600
Millington 7-1000
N. Y.—COrtland 7-622[illegible]



YOU SAVE WITH NON-RETURNABLES

BRIDGE REELS, through manufacturing techniques that have been continuously improved and streamlined, have become pre-eminently the standard for quality and dependability.

Look at these Advantages:

- **Reduced Reel Investment**
- **Less Storage Space**
- **Lower Freight Costs**
- **No Return Freight Charges**
- **No Bookkeeping**
- **No Repair Costs**
- **No Deposits Needed**
- **No More Headaches! !**

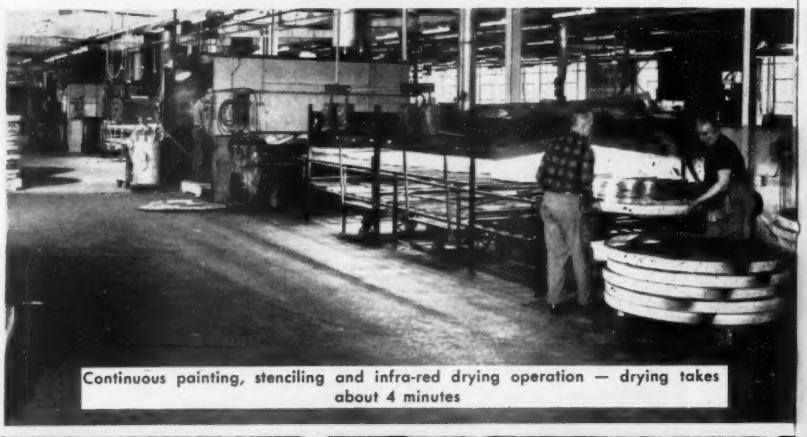
Start of production line for reel flanges.

Why BRIDGE REELS are Tops:

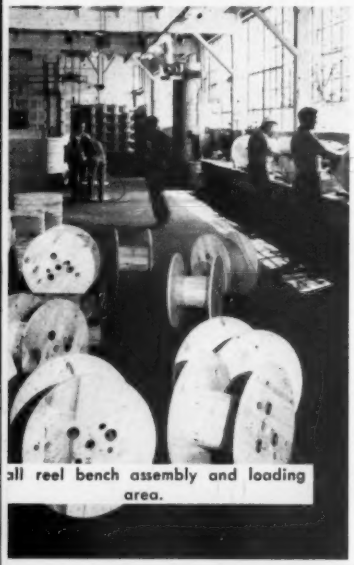
- **Lumber Kiln Dried at Plant**
- **Latest and Finest Reel Manufacturing machines —many made to Bridge Special Specifications**
- **Fabricating methods continuously improved**
- **Fast, Efficient Straight-Line Flow of Production Work**
- **Painting and Stenciling Completed in approximately 4 Minutes**
- **Reel Assemblies made with many unique Mechanical Innovations**
- **Shipping and Delivery Facilities Unequaled**

NON-RETURNABLE

WOOD REELS IN ALL SIZES FOR ALL TYPES OF ELECTRIC WIRE AND CABLE

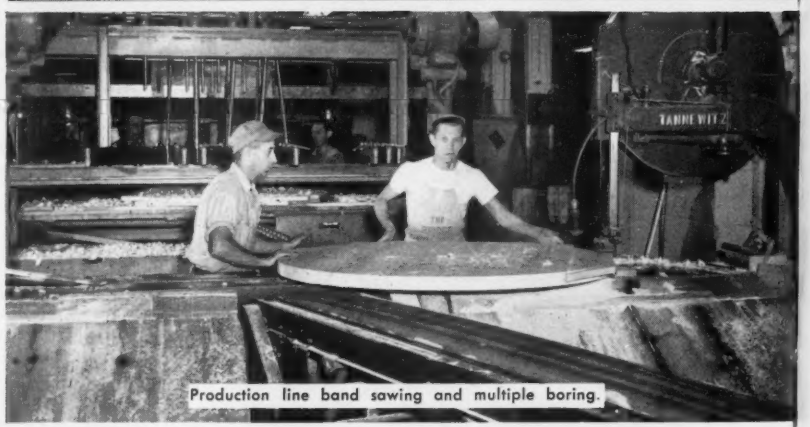


Continuous painting, stenciling and infra-red drying operation — drying takes about 4 minutes



all reel bench assembly and loading area.

NON-RETURNABLE REELS GIVE YOU A DEFINITE PACKAGING COST



Production line band sawing and multiple boring.

"REEL" GOOD —

Let us quote on your Reel needs. Send in your specifications. Better yet, visit our plant and see how Reels are made so well at so low a cost.

WOOD REELS

HIGH-SPEED SHIPPING SERVICE IN OUR OWN TRUCKS WITHIN A RADIUS OF 250 MILES OF THE PLANT, FAST FREIGHT WILL BRING YOU BRIDGE REELS WITHIN A FEW DAYS TO POINTS EAST OF THE MISSISSIPPI

TEL: THOMPSONVILLE, CONN.

WIRE AND WIRE PRODUCTS*

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 36 March, 1961 No. 3

Designated as Official Publication By The Wire Association

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ACHIEVE ALACRITY

For those small spring wires too tough for pliers, try our #4 TODD cutter.

A really "quality" tool at pliers price!

Replaceable jaws? Naturally!

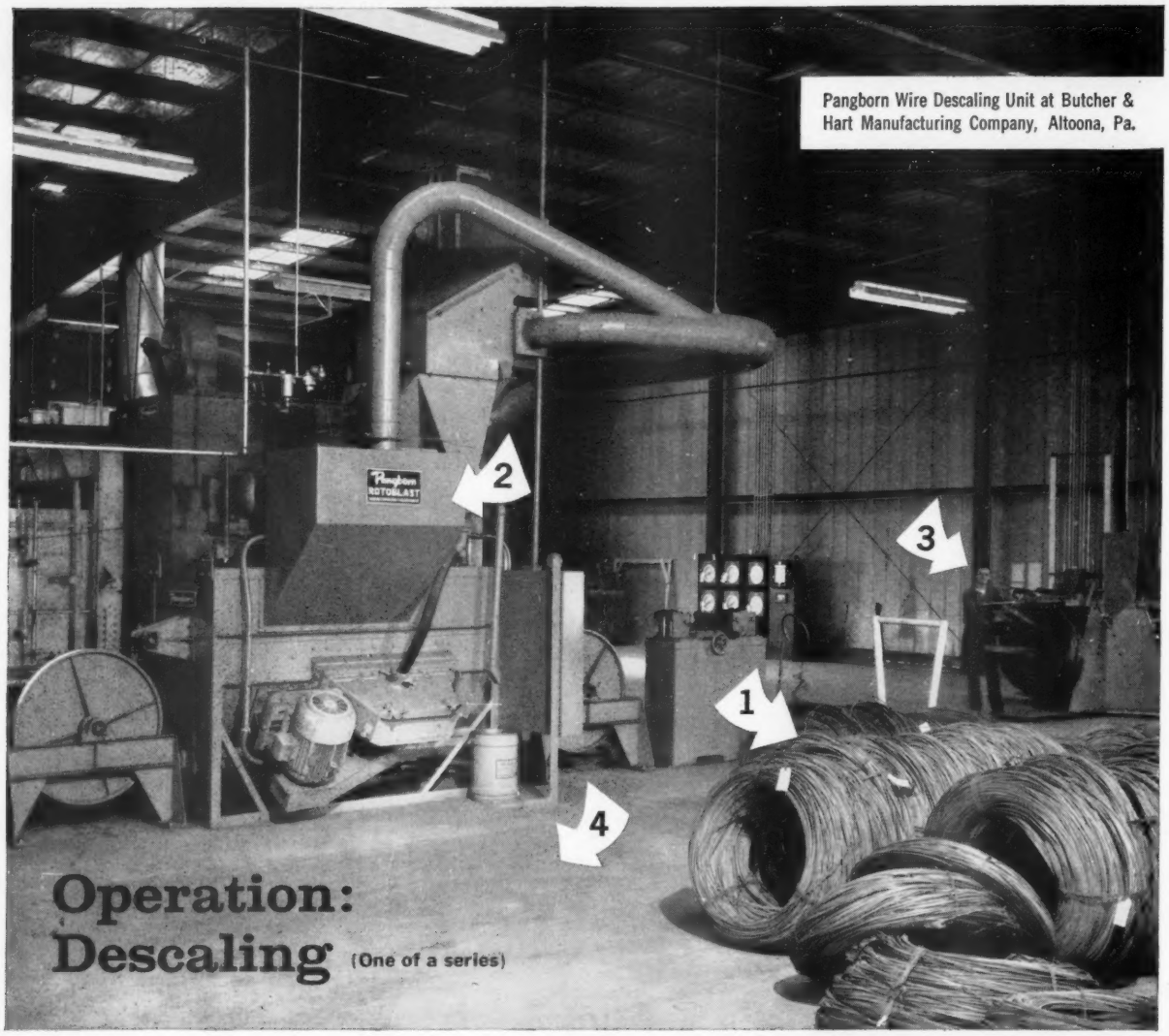
STOCKED BY MOST MILL SUPPLY DEALERS

made by

M. W. ROBINSON CO., INC.

ROCKFALL, CONN., U.S.A.

Please feel free to consult us with your wire cutting problems.



Q: Does Rotoblast end acid disposal problems?
A: Yes, and it cuts costs in the process.

1. Rotoblast eliminates loss of virgin metal

When wire and rod descaling is done through pickling, some virgin metal is invariably lost. Operating experience shows that there is no loss of virgin metal with Rotoblast Descaling. Also, there isn't any acid requiring disposal. Problems like water pollution are made obsolete in many areas of operation by Rotoblast.

2. Rotoblast reduces investments

With Rotoblast, savings on wire and rod descaling equipment can run as high as 70% on the original investment when compared with the investment required for pickling equipment.

3. Rotoblast minimizes descaling time

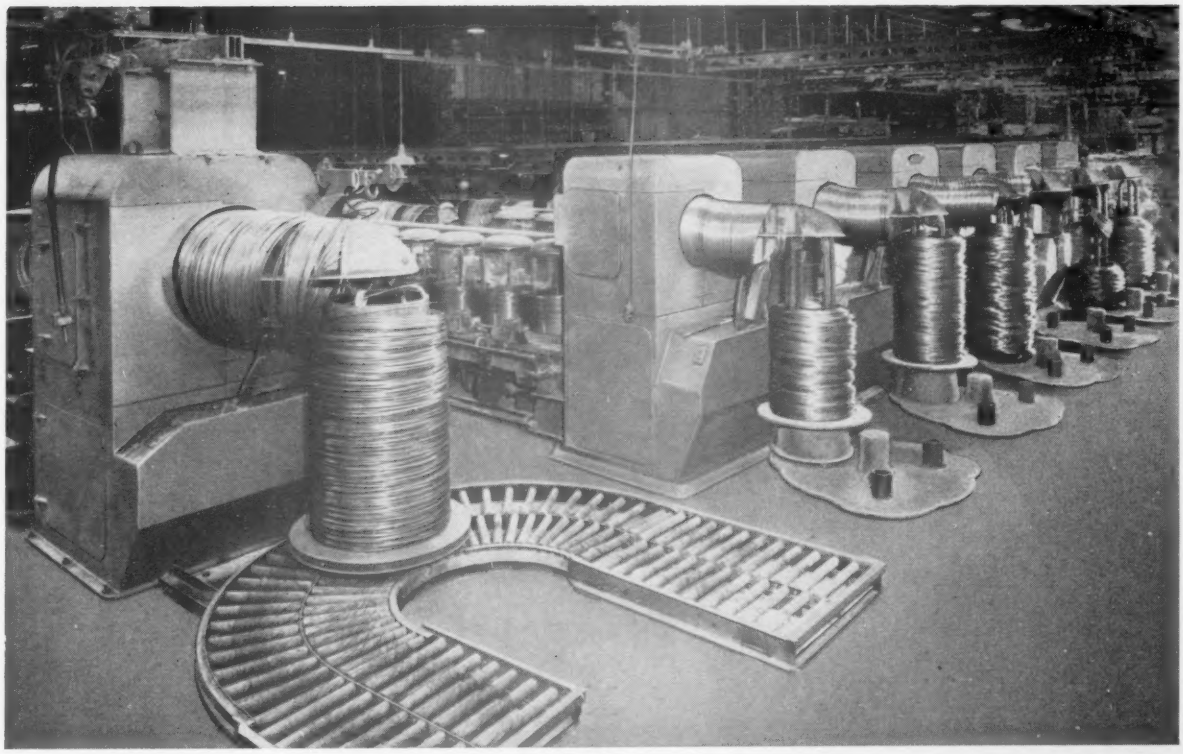
Wire and rod descaling goes faster with Pangborn Rotoblast than with pickling. Also, Rotoblast requires less manpower. Either way—or both—it cuts labor costs. (Following a patenting furnace, Rotoblast can descale multiple strands of wire, 40 or more at a time.)

4. Rotoblast frees space

Since Rotoblast requires only ¼ to ⅓ as much space as pickling equipment, it frees the difference in floor space for other operations. Also, this airless-blast machine can be easily installed in line with coating and drawing equipment to provide straight-through production. Rotoblast-cleaned surfaces are ideal for any type of coating or for drawing compounds.

You, too, can effect considerable savings with the Rotoblast Descaling Unit in your wire and rod descaling operations. Talk with your Pangborn representative or write: PANGBORN CORPORATION, 5400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning, Vibratory, Dust Control Equipment—Rotoblast® Steel Shot and Grit®.*

Pangborn
OF HAGERSTOWN



A portion of Whitacre Wire Drawing Dead Block installations at Sheffield Division of Armco Steel Corp. at Kansas City

FACTS SPEAK LOUDER THAN CLAIMS!

In actual operation Whitacre Wire Drawing Dead Blocks have delivered . . .

40%

Increase in Production

39%

Decrease in Costs!

Let us prove this statement. Investigate today!

WHITACRE CORPORATION

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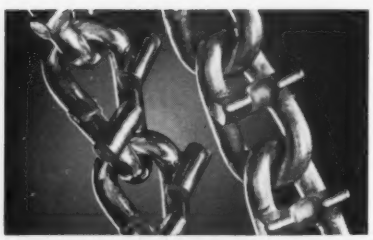
You can't beat steel chains for non-skid stops and starts



These steel chains have more "bite" and far out-last ordinary chains. Only after the hardened steel "lugs" or "bars" are worn down do the links begin to show wear.

Tires need the strong "bite" of steel for safe stops and sure starts both on slippery ice and snow. And steel chains have extra "bite" when they are reinforced with hardened steel lugs or bars welded on each cross-link. They last longer, too. Leading chain manufacturers rely on steel from Bethlehem.

Bethlehem makes nearly every grade of steel wire . . . for bird cages, upholstery springs, cold-headed products, woven-wire cloth, and welded products . . . to name just a few. Whether you need a special-purpose wire, a coated wire, or a general-purpose grade . . . you can call on Bethlehem for technical aid from experienced engineers. Simply get in touch with the nearest Bethlehem sales office or write to us at Bethlehem, Pa.

Steel for Strength
. . . Economy
. . . Versatility

Bethlehem Steel Company, Bethlehem, Pa. *Export Sales:* Bethlehem Steel Export Corporation

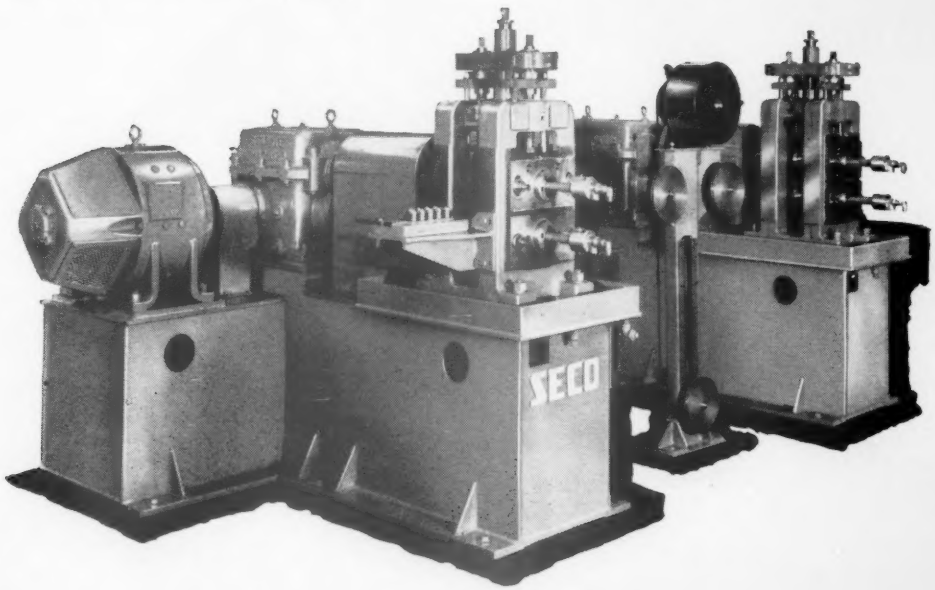
BETHLEHEM STEEL

BETHLEHEM STEEL

Predictable Performance

is yours when you change to

SECO WIRE FLATTENING MILLS



• Acceptable and predictable performance "on both sides of the fence" when Seco Wire Flattening Mills are used in your operation.

Seco's staff of trained engineers . . . specialists in solving production problems . . . are available for personal assistance to you. Call us today.

SECO

SECO STEEL MILL EQUIPMENT

- Leveling and Shearing Lines
- Combination Edging and Flattening Lines
- Tension Reels for Strip Polishers
- Narrow Strip Grinding Machines
- Multiple Strand Pull-out Rolls and Take-up Frames
- Strip Coilers (Up and Down Type)
- Traverse Reels for Narrow Strip
- Steel Coil Up-enders
- Scrap Ballers

STEEL EQUIPMENT COMPANY

P. O. BOX 737, WARRENSVILLE STATION • CLEVELAND 22, OHIO

AFFILIATED WITH *Lee Wilson* ENGINEERING CO., INC.

Quality plus economy when you buy SUMITOMO steel wire rods

Rapid developments in the wire-product field have increased industry's demand for top-quality steel wire rods. Because of its international reputation for reliability, Sumitomo Metal supplies world markets — America in particular — with 7,000 tons of wire rods every month. To keep up with this export demand, Sumitomo Metal has added to its present facilities another new wire rod mill, completely equipped with the most modern machinery available.

Dimensions of Sumitomo Wire Rods

Diameter 5mm. (13/64″) — 16mm. (5/8″)

Weight Single Bundle
about 270 kgs. — 320 kgs.
600 lbs. — 700 lbs.
Compressed Bundle (6 coils)
about 1,620 kgs. — 1,920 kgs.
3,600 lbs. — 4,200 lbs.

Coil Dimensions on Request

LEADING PRODUCERS OF STEEL WIRE RODS, PIPE AND ROLLING STOCK PARTS

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Head Office: Osaka, Japan
Cable Address: "SUMITOMOMETAL OSAKA"

New York Office: 420 Lexington Ave., New York 17, N.Y.
Cable Address: "SUMITMETAL NEWYORK"

THINKING ABOUT WIRE WEAVING LOOMS?

WAFIOS

ROUND MESH and DIAMOND MESH LOOMS
for
FIRE SCREENS, CONVEYOR BELTS, FISH NETS, etc.

CHAIN LINK FENCE LOOMS

HEXAGON MESH LOOMS
for
POULTRY and STUCCO NETTING

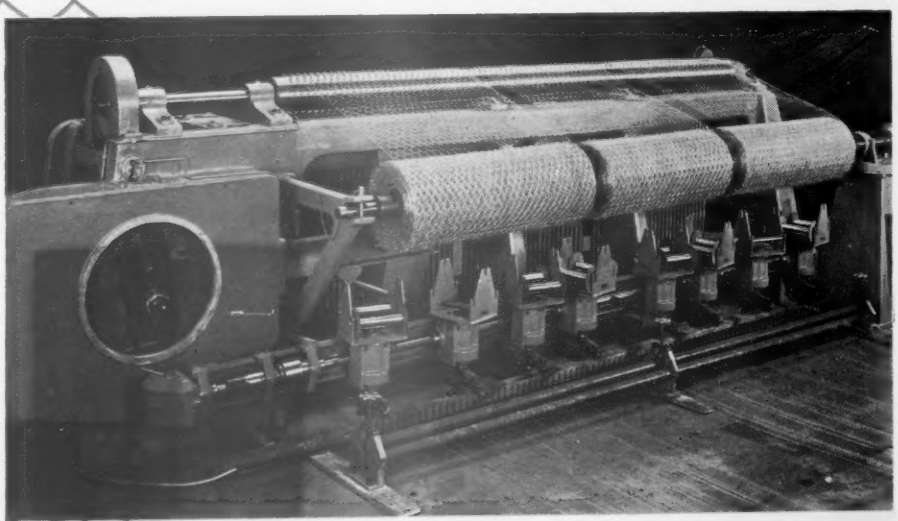
CRIMPED MESH LOOMS

Wafios
MAKES THEM ALL!

World's Most Complete Line of Wire Weaving Machines

MODEL HDS
22 & 33

The fully automatic **HEXAGON MESH WEAVING LOOM HDS** is designed for poultry and stucco netting with 100% reverse twist in mesh sizes from ¾″ to 4″ and widths up to 11 feet.



Attachments can be supplied for selvage wires or reinforcing wires every 6″ over the width of the mesh. We can also supply an attachment to double the mesh width.
These looms will produce mesh at extremely low cost per foot and with small capital outlay. Output is unusually large.

WAFIOS
MACHINERY CORP.
61 HUDSON STREET
HACKENSACK, NEW JERSEY

WAFIOS-MASCHINENFABRIK,
Wagner, Ficker & Schmid,
REUTLINGEN/GERMANY

WRITE FOR CATALOG AND COMPLETE INFORMATION

FORD ELIMINATES NEED FOR CONDENSER ADJUSTMENT WITH NEW ANTENNA LEAD-IN!

Vinyl Jacket Over Cellular Polyethylene Provides Superior Toughness with Exceptional Low-Loss Properties.

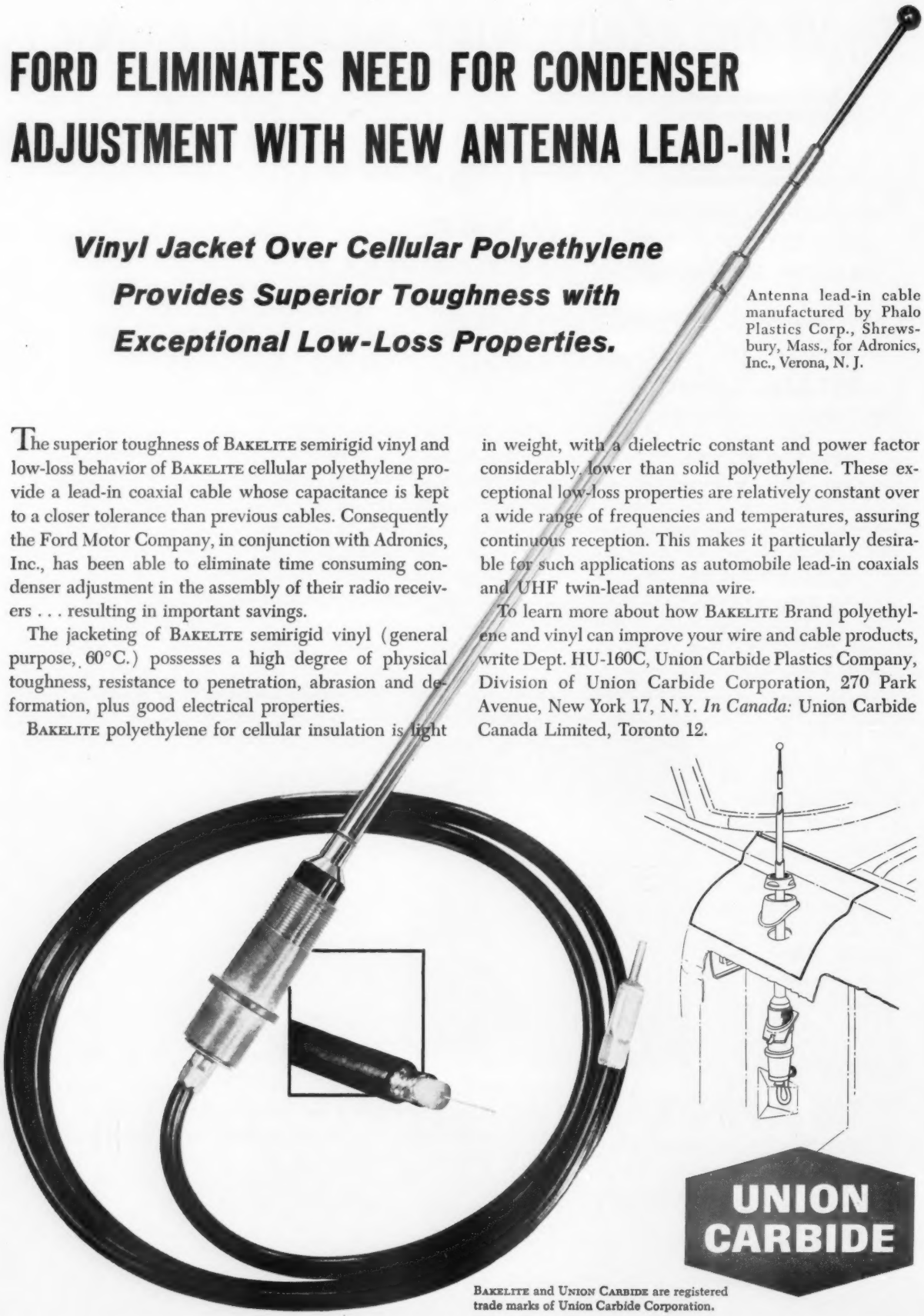
Antenna lead-in cable manufactured by Phalo Plastics Corp., Shrewsbury, Mass., for Adronics, Inc., Verona, N. J.

The superior toughness of BAKELITE semirigid vinyl and low-loss behavior of BAKELITE cellular polyethylene provide a lead-in coaxial cable whose capacitance is kept to a closer tolerance than previous cables. Consequently the Ford Motor Company, in conjunction with Adronics, Inc., has been able to eliminate time consuming condenser adjustment in the assembly of their radio receivers . . . resulting in important savings.

The jacketing of BAKELITE semirigid vinyl (general purpose, 60°C.) possesses a high degree of physical toughness, resistance to penetration, abrasion and deformation, plus good electrical properties.

BAKELITE polyethylene for cellular insulation is light in weight, with a dielectric constant and power factor considerably lower than solid polyethylene. These exceptional low-loss properties are relatively constant over a wide range of frequencies and temperatures, assuring continuous reception. This makes it particularly desirable for such applications as automobile lead-in coaxials and UHF twin-lead antenna wire.

To learn more about how BAKELITE Brand polyethylene and vinyl can improve your wire and cable products, write Dept. HU-160C, Union Carbide Plastics Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.



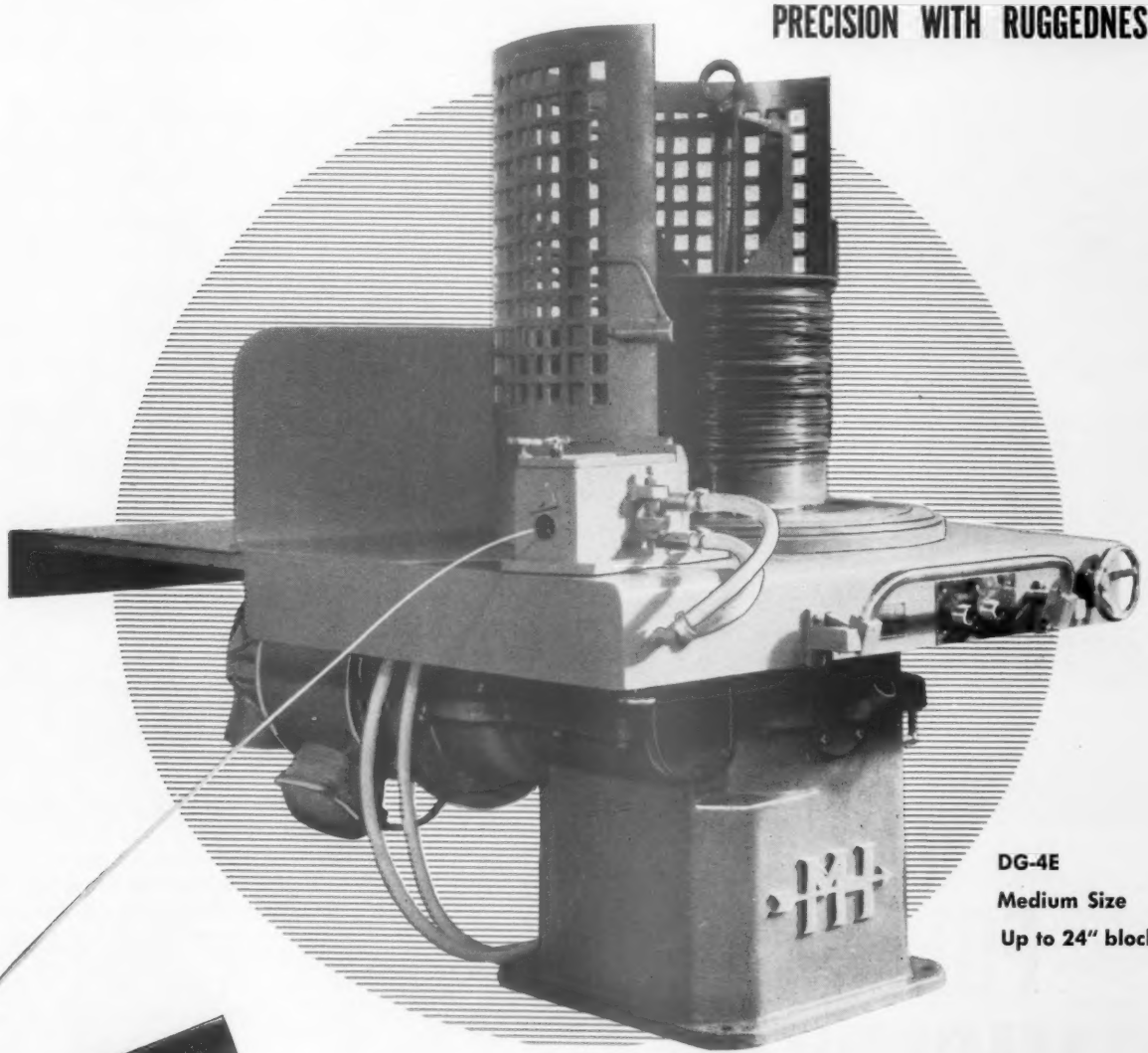
UNION CARBIDE

BAKELITE and UNION CARBIDE are registered trade marks of Union Carbide Corporation.

BULL BLOCKS

SINGLE or DOUBLE DECKED

PRECISION WITH RUGGEDNESS



DG-4E
Medium Size
Up to 24" block

BULL BLOCK Bulletin
Write for your copy

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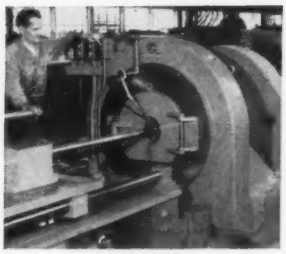
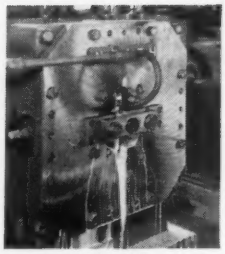
Telephone: 0240-71100

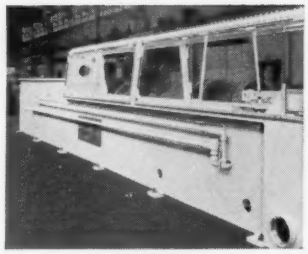
U.S. OFFICE MH. MACHINES
19002 LOMOND BLVD.
CLEVELAND 22, OHIO
TELEPHONE: WYoming 1-5830



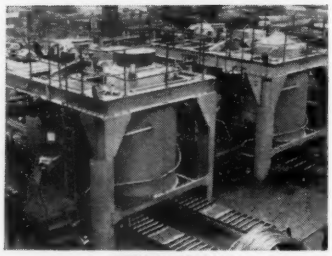
SWAGING MACHINES



TURKS HEADS

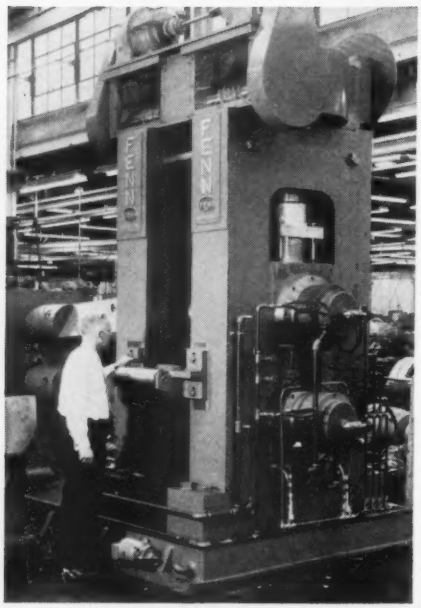


DRAW BENCHES

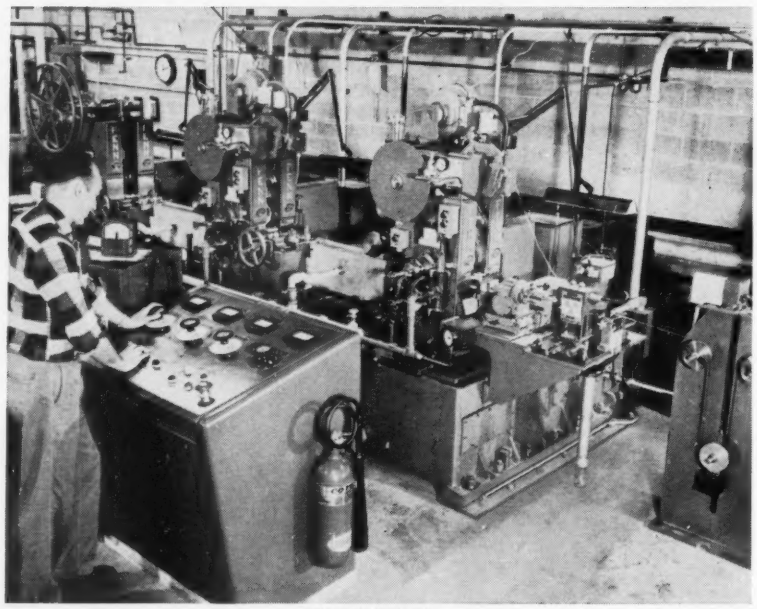


WIRE AND TUBE MILLS

PRECISION • PERFORMANCE • DEPENDABILITY



ROLLING MILLS



WIRE FLATTENING LINES

METAL FORMING MACHINES

that meet the challenges of the 60's

Within a relatively short span of years the name FENN has become well-known to users of metal forming equipment. In rolling mills . . . wire mills . . . in the nuclear industry . . . and wherever else ferrous or nonferrous metals are rolled, drawn, or formed to precision tolerances, Fenn machines are producing profits for their users. The extensive Fenn line is built on long experience in the manufacture of *precision* machinery and an equally long reputation for *performance* and *dependability*. Behind every Fenn machine is unexcelled engineering . . . from design to inplant checkout and continuing field service, plus an organization that strives to do every job better than the expected. Whatever your metal forming machinery requirements, you can depend upon your nearest Fenn representative for his experienced advice and practical help. Comprehensive literature will be promptly sent upon request. The Fenn Manufacturing Company, Fenn Road, Newington, Connecticut.

Designed and Built by FENN

WHAT'S NEWS IN ENJAY TECHNICAL SERVICE

Enjay helps reduce cost of 90°C vinyl wire insulation...

An important part of Enjay Technical Service is developing useful new products that reduce costs, yet maintain performance. Ditridecyl phthalate for use in plasticizing vinyl wire insulation is a good example of this research activity. By tests, such as the oven aging shown above, Enjay was able to prove that DTDP, made from Enjay tridecyl alcohol, performs as an efficient, non-volatile plasticizer for 90°C wire — yet reduces plasticizer cost. Test results, at right, show that the insulation exceeds the U.L. Specifications.

Enjay research facilities and technical skills are available to customers in the vinyl wire, film and sheeting industries.

If you would like to receive a free copy of our new Technical Bulletin No. 20 on Enjay oxo alcohol for plasticizers, write to 15 West 51st Street, New York 19, N. Y.

TEST RESULTS: 7 DAYS @ 121°C

	U. L. Specification Minimum	DTDP Plasticizer
Elongation	65% retention	100% retention
Tensile Strength	65% retention	101% retention
Dielectric Strength	50% retention	127% retention
Insulation Resistance*	.01 megohm based on 1000 ft.	0.36 megohm based on 1000 ft.

* 1 day and 7 days @ 113°C.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

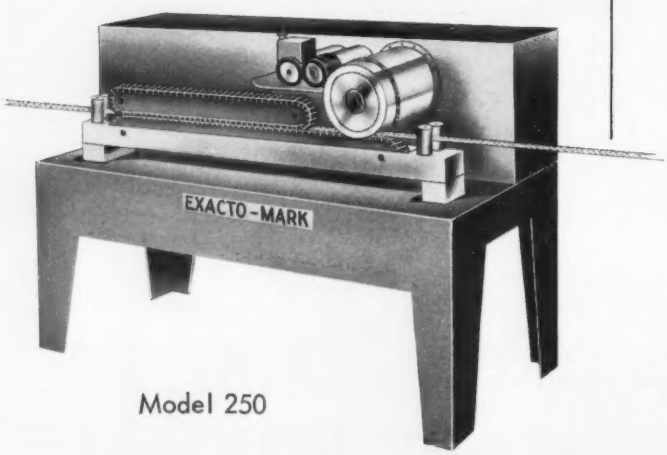
ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY

ENJAY
PETROCHEMICALS

NOW!

... available for the first time in North America, an accurate, dependable, hi-speed Automatic Cable Printing, Measuring and Marking Machine for use on most insulated wire surfaces



Model 250

EXACTO-MARK

EXACTO-MARK will imprint information such as manufacturer's name, type of cable, size and number of conductors, with ground or without, and length in 2 ft. increments on most types of insulated wire, plastic pipes, cloth, etc. at speeds in excess of 350 feet per minute. EXACTO-MARK is also a highly-accurate measuring device and the numbering attachment can be re-set at any point in its cycle.

EXACTO-MARK

Designed and built by Wire Machinery & Engineering Limited, Toronto, Canada

Distributed exclusively by:

INDUSTRIAL TRADING CO. (Canada)

1409 Yonge Street • Toronto, Canada • Phone WA. 5-1871

Who Buys Roebling Upholstery Spring Wire After You Do?

The end-user can hardly be expected to know a great deal about Roebling helical spring wire, border and brace wire, zigzag and no-sag wire, wire for automatic machines, lacing wire . . .

Thus, the qualities of uniformity, temper, tensile strength, size and finish that are yours whenever you use Roebling Spring Wire mean long life, resiliency under constant use (and abuse) where it counts the most . . . to those who buy Roebling Upholstery Spring Wire after you do.

For further information on the wide range of types, the consistent superiority and availability of these and other Roebling wire products, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

Roebling...Your Product is better for it

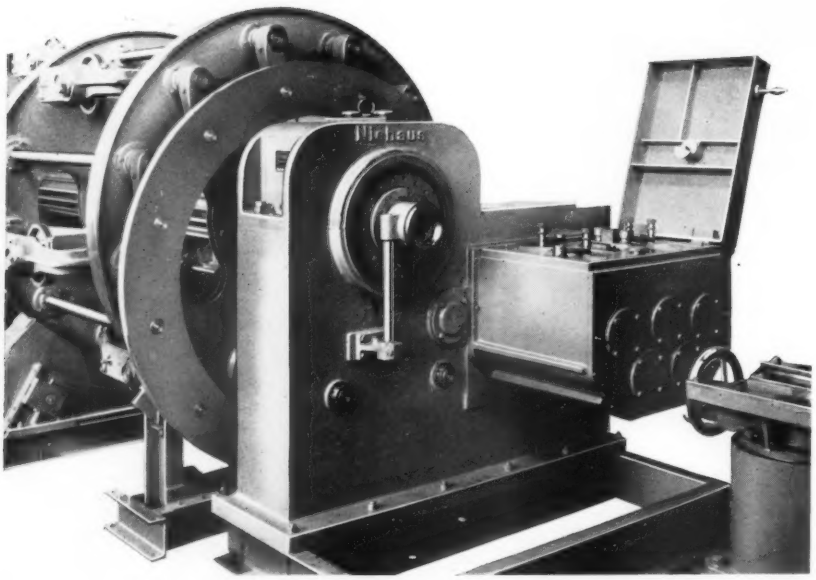
ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation

NIEHAUS

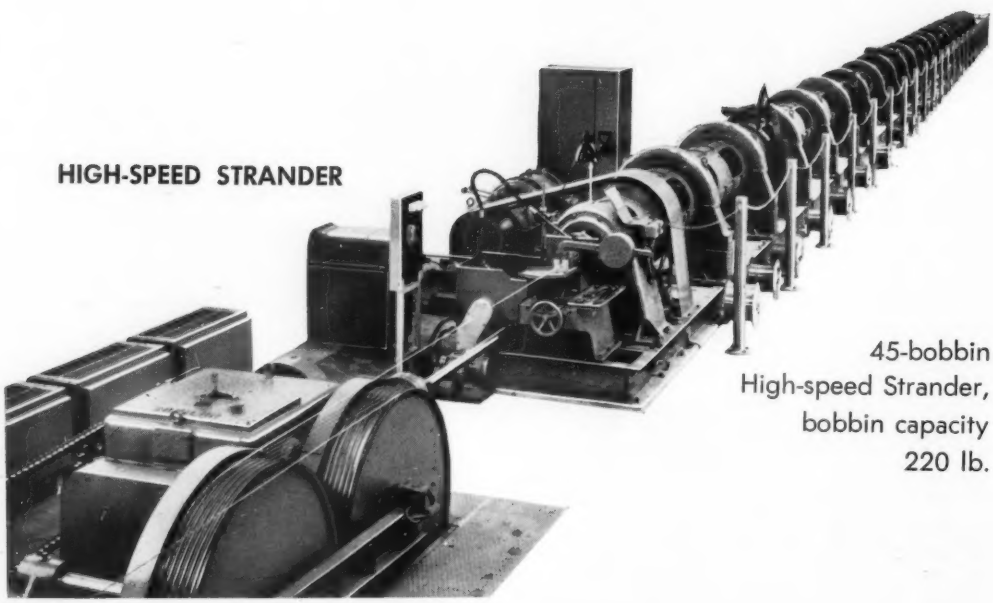
ELECTRIC-CABLE MACHINERY • WIRE-ROPE MACHINERY

PLANETARY STRANDER



We manufacture: Stranding and Rope-closing Machines of tubular and planetary design, of any size and for any number of bobbins, as well as the pertinent auxiliary machinery and equipment.

HIGH-SPEED STRANDER



45-bobbin High-speed Strander, bobbin capacity 220 lb.

MASCHINENFABRIK K. A. NIEHAUS • DUSSELDORF-RATH

Sole Representative: Paul Reicher Machinery & Equipment, Ltd., 600 Eglinton Ave., East, Toronto 12, Ont., Canada

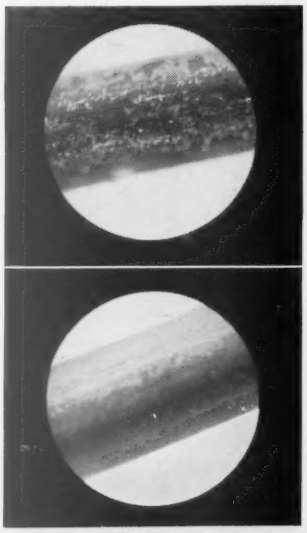
Improved Copper Coating for Wire Increases Coating Adherence, Color Uniformity

AMCHEM CUPRODINE* NO. 5 CHEMICAL PROVIDES LOW COST, NON-ELECTROLYTIC COATING FOR LUBRICATION OF CARBON AND STAINLESS STEEL WIRE, TIRE BEAD WIRE, COLOR CODING AND DECORATING PARTS

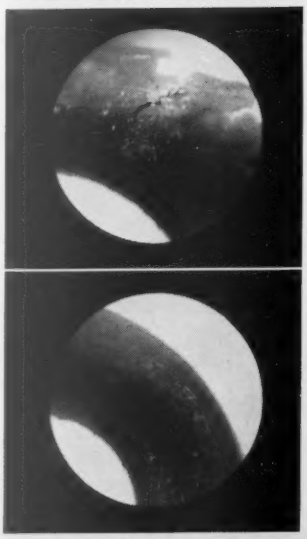
The latest Cuprodine from Amchem provides carbon and stainless steel wire and stampings with a particularly effective and adherent copper coating which appreciably reduces scratching of the wire and pickup and wear on dies during forming.

In treating tire bead wire, the uniformity of Cuprodine No. 5 coatings retained during drawing provide an excellent bonding surface for the rubber. Industry has found wide usage for Cuprodines in color coding parts while the durable and attractive copper coating provides an excellent decorative and protective finish on end products.

Investigate Cuprodine No. 5 for your own particular requirement—it's fast, economical, efficient—requires only simple immersion compared to costly racking and auxiliary equipment needed in electroplating processes.



At top, photomicrograph (50x mag.) of copper sulfated wire after removal of the coating in ammonium persulfate solution. Note heavy corrosive attack and pitting on copper sulfate-treated wire. At bottom, Cuprodine-treated wire subjected to same test.



At top, photomicrograph (50x mag.) shows copper sulfated wire after simple manual bend test. At bottom, photomicrograph shows bend tested Cuprodine-treated wire exhibiting only a slight attack to coating while copper sulfate-treated wire shows heavy flaking of coating.

Another development from Amchem's Metal Protection Laboratories, the pioneer in specialized coatings for 46 years—from the first copper coating without the use of electroplating current, to today's standard in copper coating processes—Cuprodine No. 5.

AMCHEM **CUPRODINE**

Amchem is a registered trademark of **AMCHEM PRODUCTS, INC.** (Formerly American Chemical Paint Co.), **AMBLER, PA.** • Detroit, Mich. St. Joseph, Mo. • Niles, Calif. • Windsor, Ont.

*Amchem's registered trademark for its copper coating chemical.

Where can I find it?

Look in the BUYERS' GUIDE for your answer

DO YOU have a copy of the 1961 WIRE AND WIRE PRODUCTS BUYERS' GUIDE on your desk for ready reference when you need it?

The 1961 Edition contains literally thousands of changes — of names, addresses, products, etc.

It will tell you quickly who manufactures all kinds of wire machinery, equipment and supplies; who makes different kinds of rod, bar, wire, wire products, strip, billets; and who produces various types of electric wire and cable.

In addition, in the Year Book section, it gives you:

HISTORY OF WIRE ASSOCIATION ACTIVITIES IN 1960

CONSTITUTION AND BY-LAWS OF THE ASSOCIATION

OFFICERS, DIRECTORS AND COMMITTEES FOR 1961

LISTS OF ASSOCIATION MEMBERS BY INDIVIDUALS AND COMPANIES

INDEX TO ARTICLES AND SUBJECTS PUBLISHED IN WIRE AND WIRE PRODUCTS IN 1960

LISTS OF AWARDS PRESENTED FOR MERITORIOUS PAPERS

Every wire man needs this new BUYERS' GUIDE. It is the only directory in the U.S.A. published exclusively for the Wire Industry—a real gold mine of information!

PRICE: $5.00 EACH; $3.00 TO SUBSCRIBERS TO WIRE AND WIRE PRODUCTS. PUBLISHED MAY 1st.

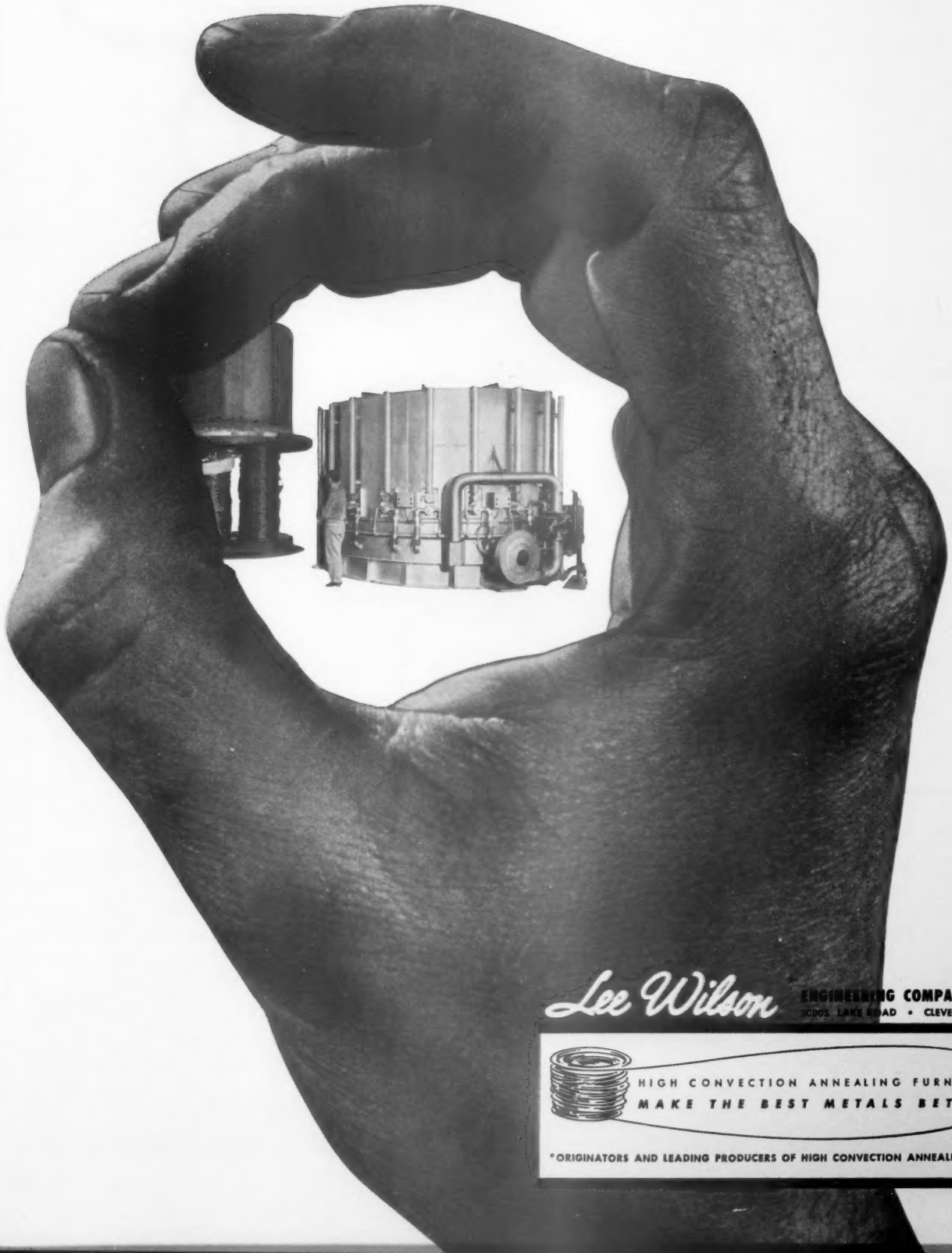
Order the Revised 1961 Edition Today from

WIRE AND WIRE PRODUCTS

453 MAIN STREET

STAMFORD, CONNECTICUT

A typical reaction to Lee Wilson high convection wire and rod annealing spheroidizing furnaces



Lee Wilson ENGINEERING COMPANY, INC.
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HIGH CONVECTION ANNEALING FURNACES
MAKE THE BEST METALS BETTER

*ORIGINATORS AND LEADING PRODUCERS OF HIGH CONVECTION ANNEALING FURNA

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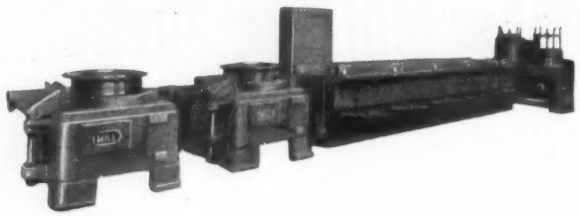
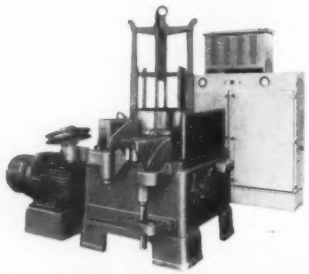


MULTIPLE STRAIGHT-LINE WIRE DRAWING MACHINE, Type MV 25, max. inlet dia. 8 mm. (hard steel), 12 mm. (mild steel), 14 mm. (copper wire).

MILL

MILL

MILL

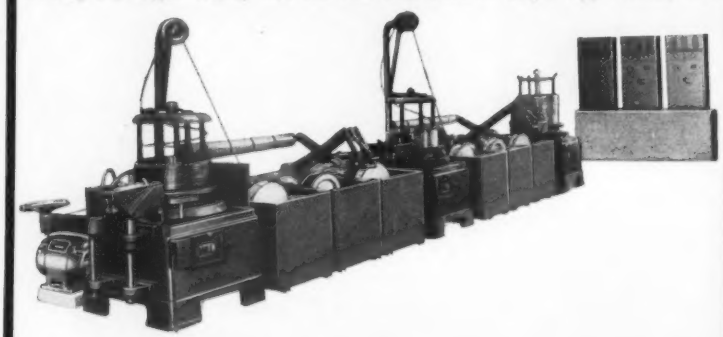


WIRE DRAWING BLOCK, Type TV 25/2, max. inlet dia. 6.5 mm. (hard steel), 8 mm. (mild steel), 12.7 mm. (copper wire).

NOVELTY

MILL

CONTINUOUS WIRE DRAWING AND COPPER COATING EQUIPMENT, suitable for drawing and copper coating hard and mild steel wires for bright copper coated wire.



SPOOLER, Type RM 15/1

The Societa Generale delle Macchine "Mill" announces the availability of the following equipment:

Single or double deck Bull Blocks • Multiple Pass Straight Line Wire Drawing Machines • Submerged System Wire Drawing Machines • Continuous Wire Drawing and Copper Coating Plant • Dual Reel Take-ups • Rotating Die Holders • Constant Tension Spoolers • Single Coilers • Multiple Coilers • Mechanical Descaler • Roller Pointing Machines • Rod Flippers • Electrical Winch • Rotating Flippers • Pull-in Dogs • Deburring Pliers.

GENERAL CATALOGUE ON APPLICATION.

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Sede Soc.: via V.Monti, 9, Milano.
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ITALIA

THE NEW **LEWIS** *Convertible**

AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES WITH VARIABLE SPEED DRIVE AND DUAL-CENTER STRAIGHTENER ARBOR

Front View No. 2CV4 ... Capacity 1/16" to 1/4" diameter. (No. 2CV5 capacity 1/16" to 5/16" diameter.)

* The new Lewis No. 2CV series is equipped with our Dual-Center Rotary Straightener Arbor and can be quickly converted to handle shapes by installing our interchangeable Roll Straightener.

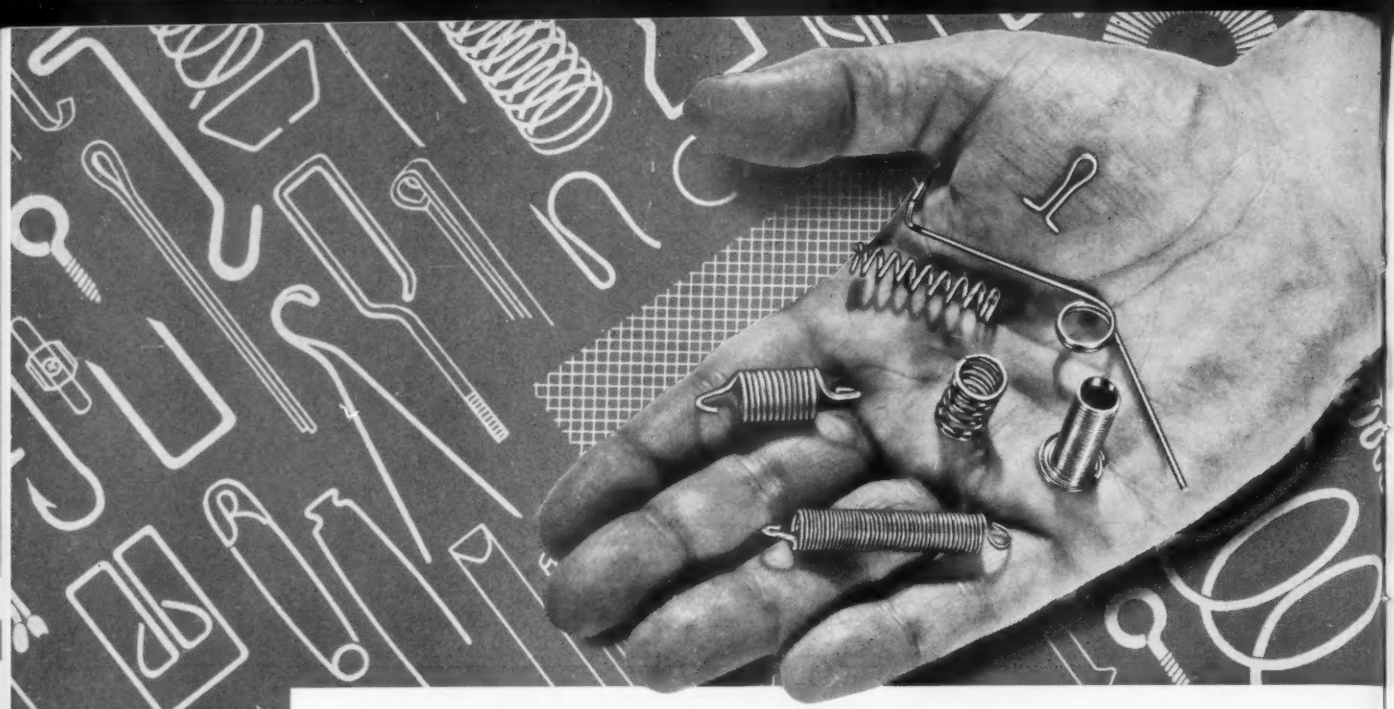
This convertible feature introduces a new flexibility in wire straightening and cutting operations . . . one machine can serve a double purpose in your plant. Higher production with greater accuracy is achieved through the use of a Variable Speed Drive which permits the correct feed speed (up to 200 FPM) for all requirements.

The outstanding feature of this series is the DUAL-CENTER STRAIGHTENER ARBOR (Pat. Pending) for round wire. This feature increases the range of the machine and makes it possible to precision straighten small diameters below the capacity of other machines.

Other models available to handle .012" to 1" diameter, as well as shapes.

THE LEWIS MACHINE COMPANY

3441 East 76th Street • Cleveland 27, Ohio • A Division of Curtis Mfg. Co.



PAGE SPECIAL HB
Can Cut Wire Costs Up to 60%

You can use PAGE *Special* HB for many jobs where music wire has always been specified—and save up to 60% on your wire costs! Tensile strengths of *Special* HB, which is available in the size range .020″ diameter to .162″ diameter (bright finish and galvanized), approach those of music wire in all sizes—and in sizes .090″ diameter and coarser equals them! Here are some typical examples:

SIZE	STANDARD HB	SPECIAL HB	MUSIC WIRE
.1620	219,000 min.	**249,000 min.**	249,000 min.
.1350	227,000 "	**258,000 "**	258,000 "
.0800	244,000 "	**276,000 "**	282,000 "
.0200	310,000 "	**320,000 "**	350,000 "

If you now use music wire, or have been prevented from using it because of its high cost, it makes sense to investigate PAGE *Special* HB.

WHATEVER your wire requirements, you can count on PAGE quality from America's leading special-purpose wire mill. PAGE will give you the tensile strength, ductility, finish, tolerance and other properties you require in a wide range of manufacturers wire items — including corrosion-resistant ACCO *Aluminized* Wire and wires of special shapes.

Write for details. Write us at Monessen, Pa., for Booklet **DH-107a** for the story on PAGE *Special* HB—or for information on other wires.

ACCO

PAGE MANUFACTURERS WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE *—the source for answers to wire problems*

Your Insulation Material Engineered to Your Specifications

RUBBER ···· VINYLS or other POLYMERS ?

Kenflex® RESINS

TRADE MARK

SOLID OR LIQUID

KENFLEX® and KENMIX® dispersions are extensively recommended for wire and cable compounding by manufacturers of Butyl and Neoprene.

KENFLEX® resins impart excellent electrical properties and moisture resistance to your wire insulation. They are particularly beneficial in compounds for:

NEOPRENE ..... for retarding crystallization.
HYPALON ..... for easy dispersion of litharge.
BUTYL ..... for outstanding ozone resistance.
VINYLS ..... for fast fluxing.
NITRILE & NITRILE-VINYL COPOLYMERS ..... for fast fluxing, ozone resistance and mold flow.

Material For Your Information

BULLETINS:

Nitrile	No. 1
Butyl & Hypalon	2
Neoprene	3
Vinyls	4
Kenmix dispersions	6

KENRICH PETROCHEMICALS, INC.
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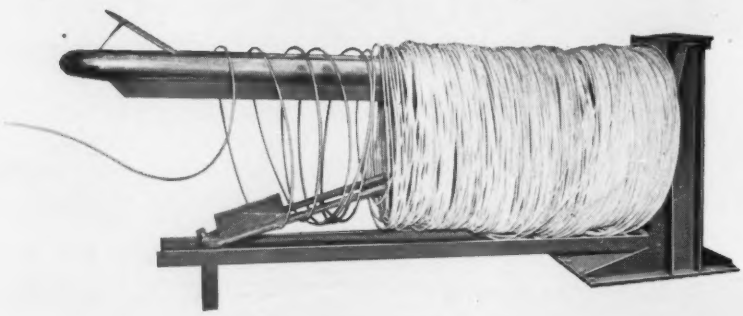
production-wise
wire men choose

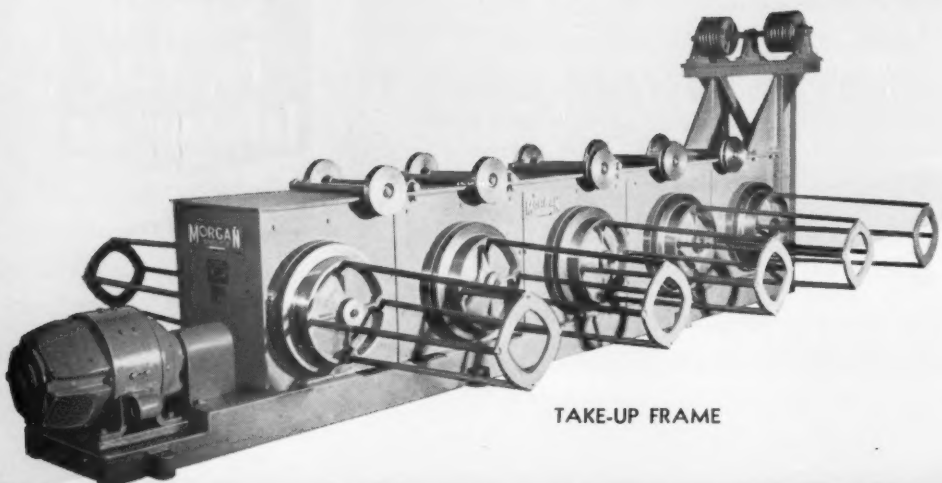
MORGAN AUXILIARY WIRE DRAWING

MOTOR DRIVEN
POINTER

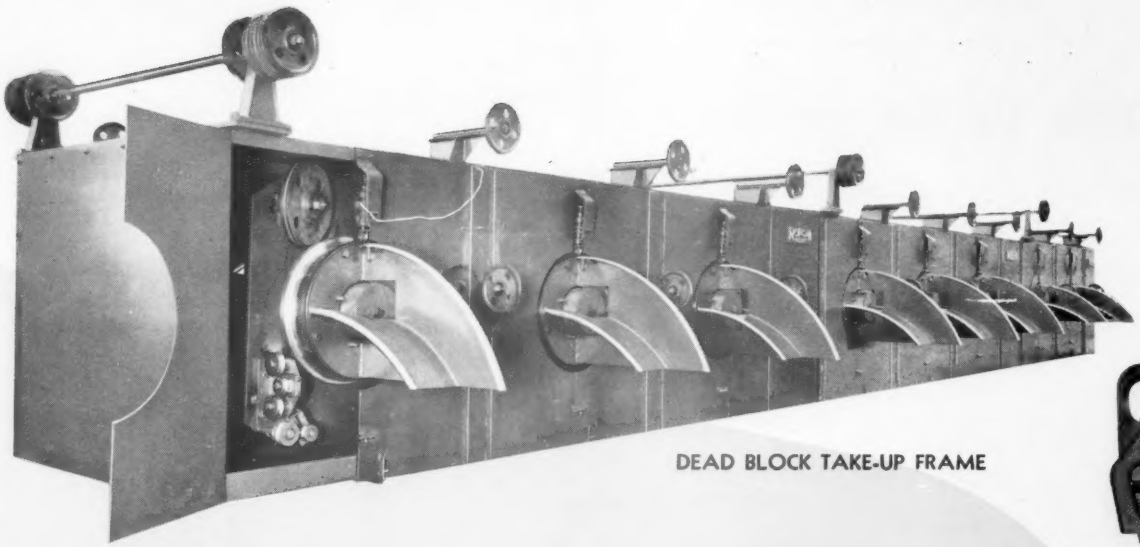


BOOM FLIPPER

MOTOR DRIVEN
POINTER



TAKE-UP FRAME



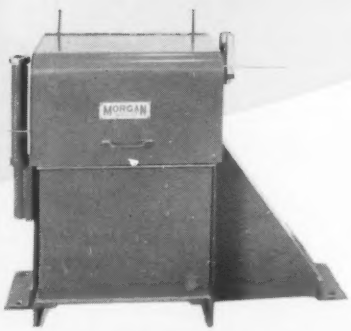
DEAD BLOCK TAKE-UP FRAME

GRIPS

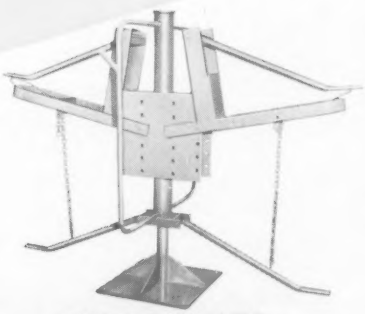
EQUIPMENT

You increase productivity with the MORGAN line of efficient, well-designed, auxiliary wire drawing equipment. Skilled wire machinery engineers have designed every piece of MORGAN Wire Drawing Equipment to give you maximum production efficiency.

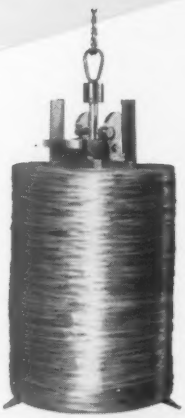
HAND POINTER

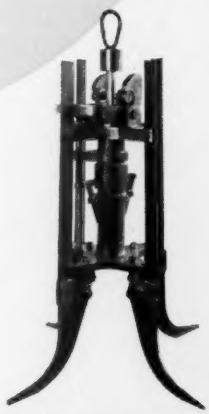


MECHANICAL DESCALER



DOUBLE TURNTABLE FLIPPER





COLLAPSING RIDING STRIPPER

MORGAN WORCESTER

W5

MORGAN CONSTRUCTION CO.

WORCESTER, MASSACHUSETTS

ROLLING MILLS · MORGOIL BEARINGS · WIRE DRAWING MACHINES · COMBUSTION CONTROLS

MEETING OF THE ELECTRIC WIRE AND CABLE SECTION OF THE WIRE ASSOCIATION

April 27-28, 1961, Sheraton-Atlantic Hotel, New York, N. Y.

TENTATIVE PROGRAM

April 26, 10 A.M. — Meeting of Board of Directors of The Wire Association.
2 P.M. — Meeting of Electric Wire & Cable Management Committee.
12 M.-7:30 P.M. — Registration Desk open.

April 27, 8 A.M. — Registration
10:30 A.M. — Busses leave hotel for Plant Inspection Tour of Bell Telephone Laboratories at Murray Hill, N. J. Luncheon there as guests of the Laboratories. Busses start return at 4 P.M. Full details on this tour will be found on page 306.
6-7:30 P.M. — Hospitality Hour.

April 28, 8 A.M. — Registration
9 A.M. — Technical Session
MODERATOR: Richard Bliss, Vice Pres., Mohawk Development Service, Inc., Schenectady, N. Y.

PAPER: "Silicone Rubber Insulated Wire and Cable", by J. P. Harrington, Rubber Market Development, Silicone Products Div., General Electric Co., Waterford, N. Y.

PAPER: "Wire Insulating by the Fluidized Bed Process", by C. A. Brown, Engineering Research Center, Western Electric Co., Princeton, N. J.

PAPER: "The Vacuum Hopper in the Extrusion of Electrical Insulation Using PVC Dry Blends", by Neil C. Flathers, Robert E. Johnson, Vernon R. Pallas and Dr. W. Mayo Smith, Research Center, Escambia Chemical Corp., Wilton, Conn.

PAPER: "Extruded Cellular Vinyl", by Andrew D. Varenelli, Senior Research Specialist, Naugatuck Chemical Div., United States Rubber Co., Naugatuck, Conn.

1:30 P.M. Technical Session, Continued.
MODERATOR: David Barr, Plant Eng., National Electric Div., H. K. Porter Co., Ambridge, Pa.

PAPER: "Establishing a Tape Standardization Program", by Robert W. Pallett, Electrical Wire Div., John A. Roebling's Sons Div., The Colorado Fuel & Iron Corp., Trenton, N. J.

PAPER: "Application of Treated Paper in Filling Electrical Cables", by R. L. D. Aigler, Plymkraft Div., Plymouth Cordage Co., Plymouth, Mass.

PAPER: "Modernized Enameling and Packaging Procedures", by Fred J. Bieber, Pres., Acrometal Products, Inc., Minneapolis, Minn.

PAPER: "Cable Stranding", by Leslie O. Reichelt, Western Electric Co., Chicago, Ill.

This meeting is an important one for all men concerned with production problems in the manufacture of Electric Wire and Cable and all are cordially invited to attend.

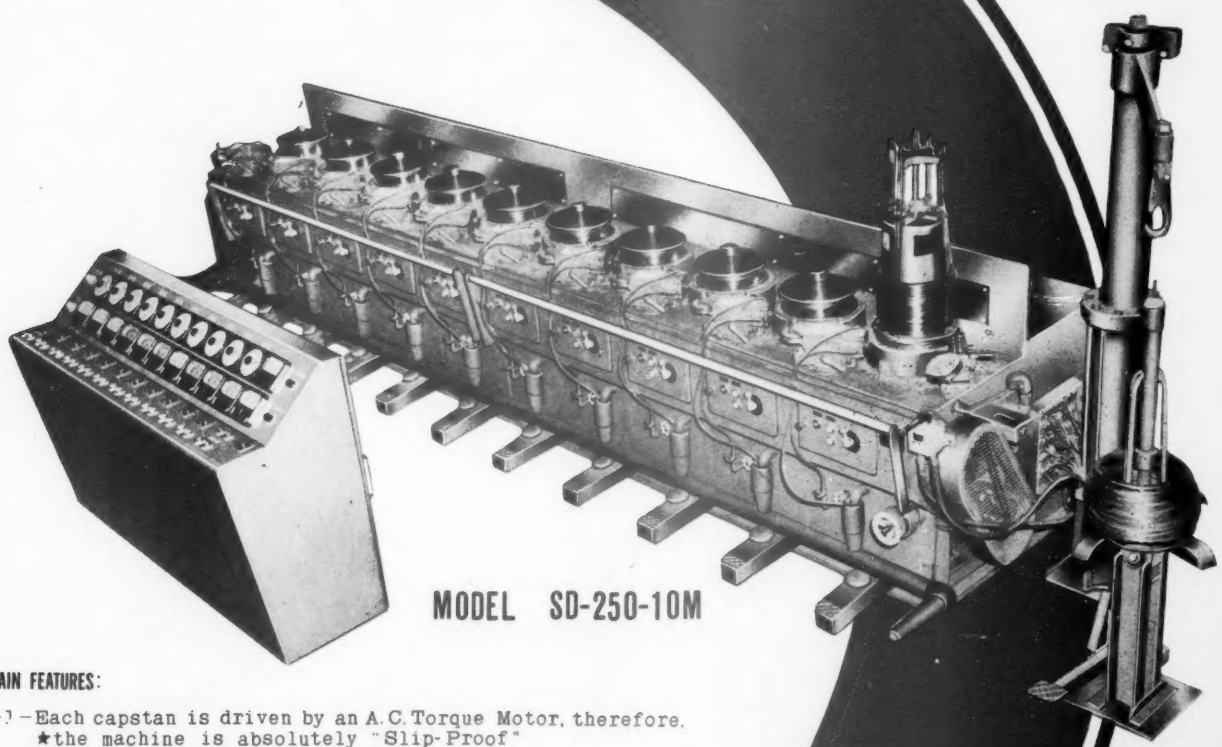
If you are not a member of the Association and would like hotel accommodations, write or 'phone for a hotel reservation card. Association members receive their hotel cards by mail. Be sure to attend this meeting!

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary
Tel.: DAvis 3-0482

453 MAIN STREET ● **STAMFORD, CONN.**

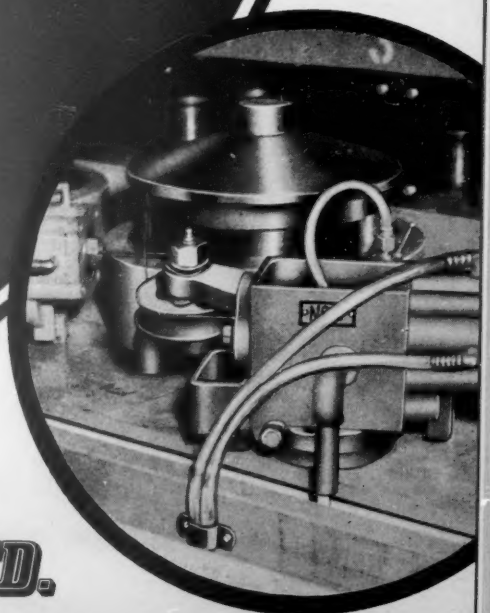
A NEW Straight Line Wire Drawing Machine for SMALL Wire



MODEL SD-250-10M

MAIN FEATURES:

-1-Each capstan is driven by an A.C. Torque Motor, therefore.
★the machine is absolutely "Slip-Proof"
★drawing speed and back pull are easily controlled by the voltage regulation.
★D.C. power is unnecessary.
-2-Revolving Die Holders
★direct the wire into perfect roundness.
★reduce the wear on dies.
-3-Designed for both dry and wet drawing.
-4-Simply structured, easy to operate.
These consistent, high-quality performances enable to draw piano wire, stainless steel wire and dumet wire (up to 2.5mm in diameter), all at high speed, and insure accurate standard of products.



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WIRE and WIRE PRODUCTS

reaches many prospects

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No matter how big you are, the odds are you don't know all your actual prospective customers.

If your company is small, it is even more important to be "calling" on your prospects and customers regularly through advertising.

Your advertising in Wire and Wire Products will be seen by many people in the plants you wish to "sell", whom your salesmen never would see, yet who specify, actually buy or who influence decisions on products to be purchased. Your advertising is bound to be of immeasurable value to you, too, in paving the way for a good reception for your salesmen when they do call. And the field's buying power is tremendous!

WIRE AND WIRE PRODUCTS circulation is all paid. We have no agents, offer no premiums nor make special inducements to get circulation, except the value of the editorial contents in itself—yet our renewals have averaged 97% or better for many years. That's why it is a good and forceful advertising medium for all concerns who have products to sell to this vigorous and progressive industry.

———— • ————

Subscribers by Types of Mills in the Industry

1. Rod, Bar and Wire (producers of rod, bar and wire in all metals and shapes) 38%
2. Forming and Fabricating Plants (mfrs., largely from purchased wire, of springs, wire cloth, bolts, nuts, screws, rivets, wire forms, fences and fencing, wire specialties, wire rope and electric wire and cable) 59%
3. Miscellaneous—Libraries, Research Organizations, Jobbers, Distribution, etc. 3%

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1. Executives: Presidents, Vice Presidents, Secretary-Treasurers, Purchasing Agents, Sales Managers 22%
2. Operating: Vice Presidents, General Managers, Works Managers, Superintendents and Assistant Superintendents. 58%
3. Research and Maintenance: Plant Engineers, Metallurgists, Laboratory Technicians, Foremen and Inspectors 19%
4. Libraries 1%

———— • ————

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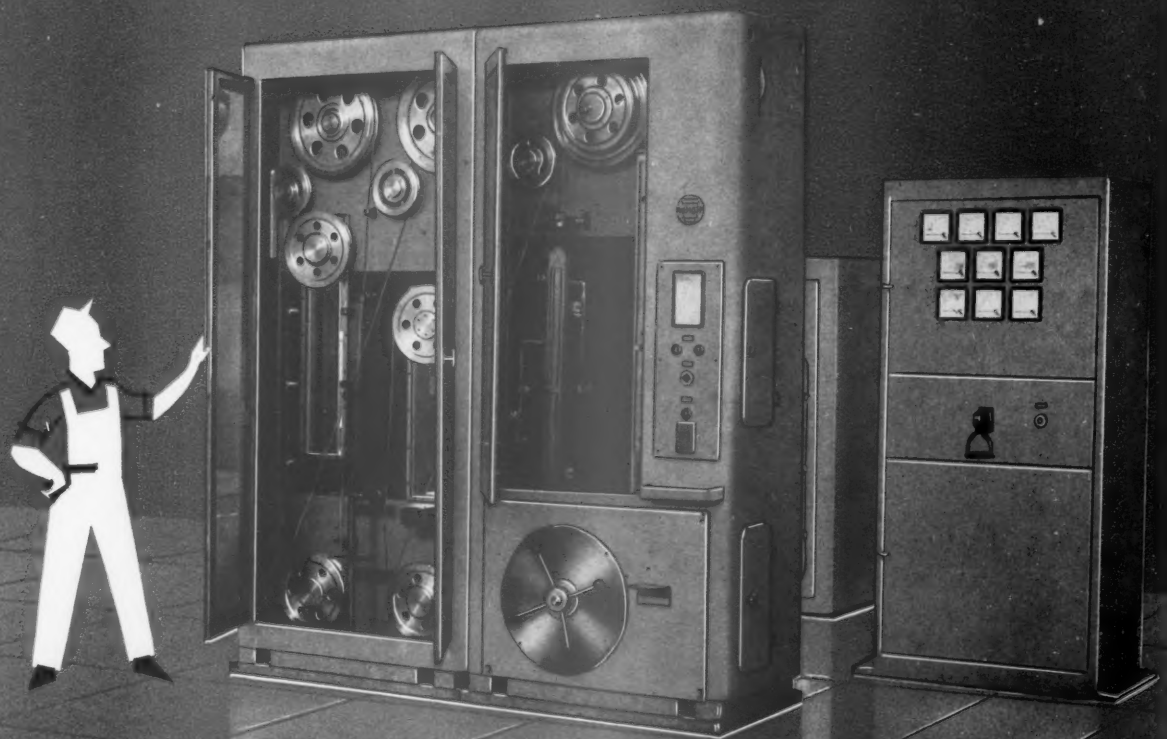
Large Continuous Electric Annealer VG 85 to be worked in combination with any copper rod break down machine, for bright annealed finished wire, for sizes between .14" and .048". Finishing Speeds up to 3000 to 4000 ft/min.



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THE ELECTRIC WIRE & CABLE SECTION
of
THE WIRE ASSOCIATION

The committee, appointed by the Association's Board of Directors, the Electric Wire and Cable Management Committee, extends to all persons interested in and concerned with the production of insulated wire and cable a cordial invitation to join with them in promoting the progress of this branch of the wire industry. This Management Committee presently is comprised of:

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Bell Telephone Laboratories, Inc.
Murray Hill, N. J.

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Reynolds Metals Co.
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Vice-Pres.-Research
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270 W. Mound St., Columbus 15, Ohio

Marshall V. Yokelson, Chf. Met.
General Cable Corp.
Bayonne, N. J.

The committee arranges for papers for regional meetings and the Annual Convention, reviews them to see that they are desirable as to subject matter and quality, and formulates policies that will promote the best interests of insulated wire production personnel. Recent authorization to increase the membership to twenty-five will be implemented by further appointments in the near future.

You are invited to send for a booklet describing the activities of The Wire Association and a membership application card.

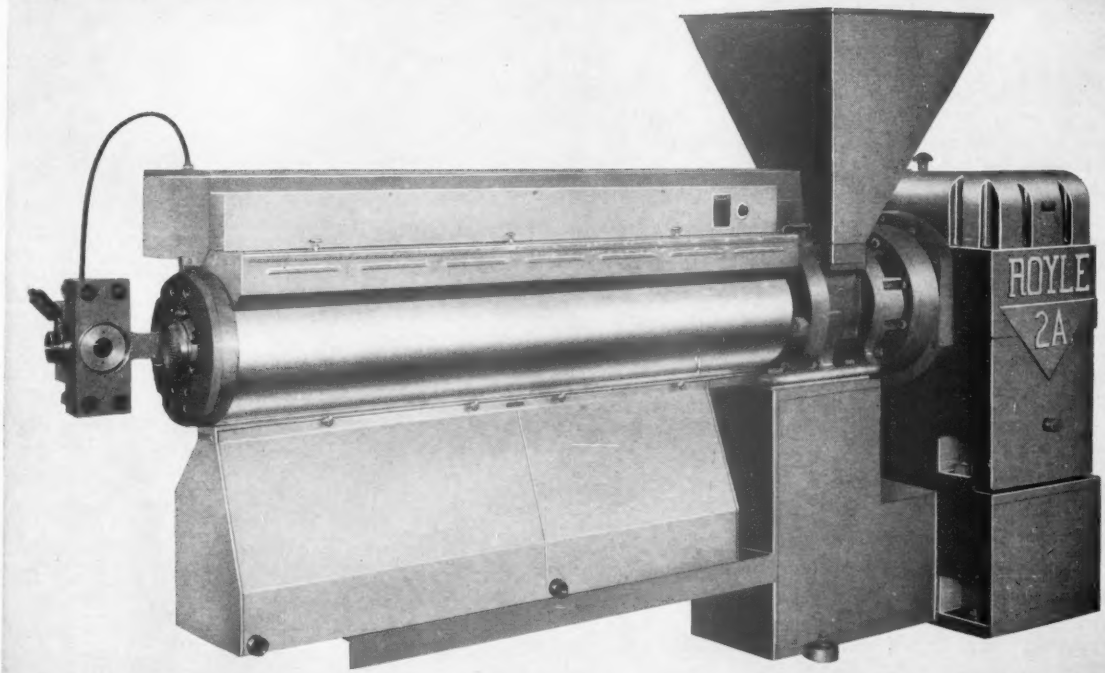
THE WIRE ASSOCIATION

RICHARD E. BROWN, EXECUTIVE SECRETARY

453 Main St. **Stamford, Conn.**

Royle brings you

FASTER PRODUCTION WITH LESS WASTE



Royle Spirod Extruders are expressly designed for high-speed Vinyl Extrusions. At the same time, they assure you quality controlled production not before obtainable.

The engineering advances that bring you these benefits are exclusively Royle's: high output, high stock screw speeds, due to longer length to diameter ratios; and extremely efficient evaporative cooling.

Longer L/D screws provide greater plasticizing ability, while evaporative cooling at any point on the cylinder removes the excess frictional heat generally associated with high stock screw speeds.

As they have been since 1880,
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Please, send me full information about Royle High Speed Vinyl Extruders.

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The PLANT VISIT to the BELL TELEPHONE LABORATORIES

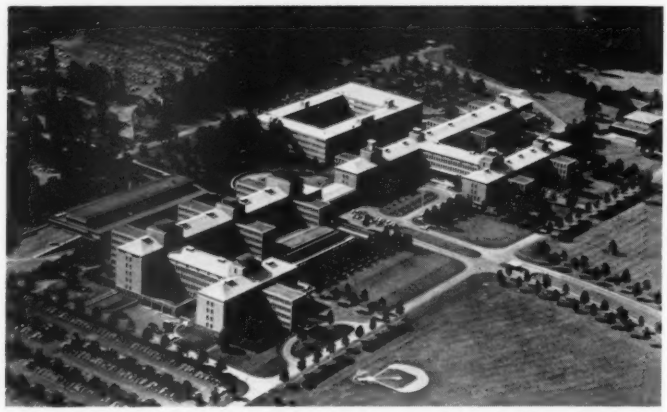
During the ELECTRIC WIRE & CABLE REGIONAL MEETING

April 27, 1961, Murray Hill, N.J.

Busses will leave the Sheraton-Atlantic Hotel in New York at 10:30 A.M. Upon arrival, Bell's guests will assemble in the Arnold Auditorium. After a short address of welcome, the group will be conducted to the restaurant for luncheon as Bell's guests.

At one o'clock the visitors will be separated into small groups and guided through points of particular interest to wire men.

Upon return to the Auditorium, R. J. Nossaman, Director of Design and Engineering, will talk briefly on the work there.



View of Bell Telephone Laboratories from the air.

SOME POINTS OF INTEREST TO BE SEEN

THE ARNOLD AUDITORIUM — Named after Bell's first Director of Research, this room is designed for perfect acoustical conditions, and is one of the company's acoustical laboratories.

ENVIRONMENTAL PROTECTION LABORATORY — Since outside telephone equipment must withstand the deteriorating effects of atmosphere, ground and ocean-bottom forces, this laboratory studies chemical and biological actions on organic and inorganic materials. The corrosion of metals must be controlled, if long, economical life in outside equipment is to be achieved, the work done here contributing to these factors.

POLYMER PROCESSING LABORATORY — Here scientists study commercial rubber and plastics to be used as wire jackets and elsewhere. Various types of mixers and mills are in operation preparing compounds. An extrusion machine is used to evaluate the materials. This laboratory, on a pilot plant basis, simulates conditions in many electric wire plants.

THE ANECHOIC CHAMBER — This is the "dead" or "free-space" room, having acoustical conditions existing several miles above the earth. In this room, unlike the Auditorium, sound is caused to decay upon entering acoustical cavities in the walls and ceiling. 99.8% of all sound decays upon entering the cavities. The room is used for basic research studies in acoustics and for testing telephone apparatus.

TRANSISTOR MODELS LABORATORIES — In order to supply various departments with special transistors for experimental work, limited quantities are produced. Germanium and silicon crystals are cut and lapped under ideal conditions for experimental work on amplifiers for future submarine cables. They must be designed to give 20 to 40 years of service.

METALLURGICAL RESEARCH DEPARTMENT — All phases of metals research are conducted here to determine physical and electrical properties. Other activities embrace the study of magnetic and semiconductor materials, enamels, solder and metals processing and testing.

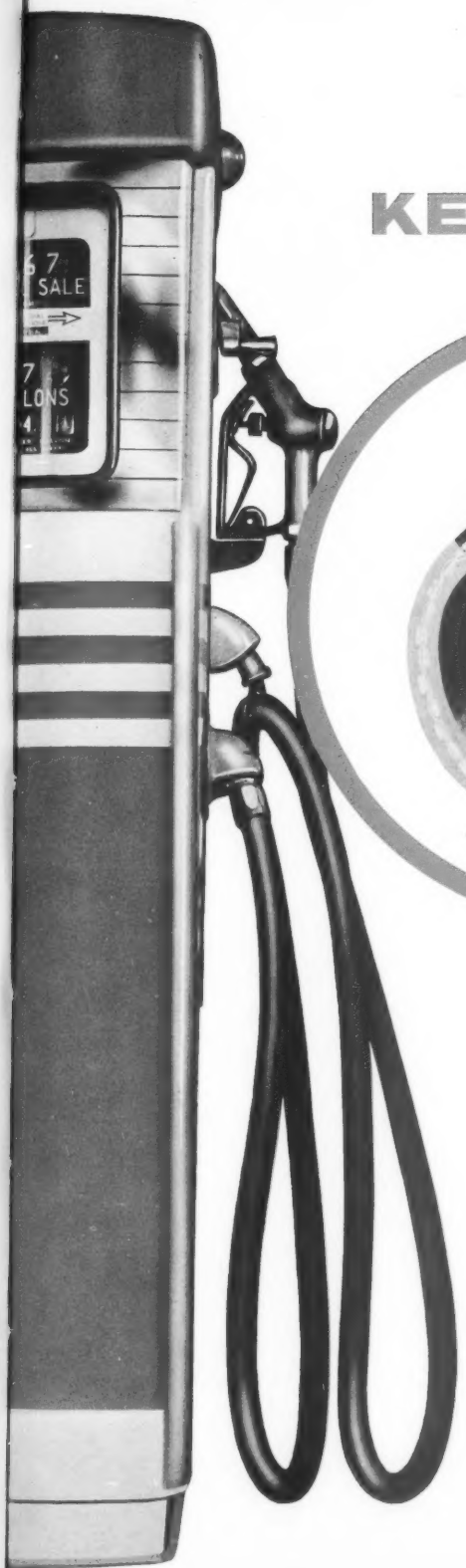
This plant visit is unusual in that it offers wire men an opportunity to see many operations out of which will develop some of the products that will become commonplace in the future. All persons attending the Regional Meeting are invited — and urged — to avail themselves of the chance to visit these mammoth R & D laboratories. Your Program Committee feels that it has been fortunate in being able to offer this exceptional plant tour for the Electric Wire & Cable Section's meeting.

Full program details will be found on page 300

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

453 MAIN STREET **STAMFORD, CONN.**



KEYSTONE WIRE...

long life "backbone" for gasoline hose...

Electric Hose & Rubber Co., Wilmington, Delaware, world's largest hose manufacturer, reinforces their Delmar gasoline pump hose with Keystone Drawn Galvanized MB Spring Wire to prevent kinking and collapse and to resist corrosion. This high quality wire and rayon cord are circularly woven around an inner hose lining . . . automatic horizontal woven hose machines do the job. The outside cover is extruded over the carcass and the final product vulcanized.

Keystone Drawn Galvanized MB Wire with its close diameter tolerance, uniform temper throughout the coil and special zinc coating has been developed to work perfectly in the highly automated machines of Electric Hose & Rubber Co. Regular galvanized wire just won't work.

Just as Keystone Wire Specialists successfully produced this high carbon quality wire that has proved so satisfactory for Electric Hose & Rubber Co., they would like the challenge of developing a wire to improve upon your present wire product. See your Keystone Representative soon; he will be pleased to discuss your wire problems.

Keystone Steel & Wire Company, Peoria, Illinois

KEYSTONE

WIRE FOR INDUSTRY

MANUFACTURED AT PEORIA, ILLINOIS, U. S. A.

Here is COOK's combination fine

WIRE DRAWING and ANNEALING UNIT

. . . most compact, most complete machine of its kind ever designed!

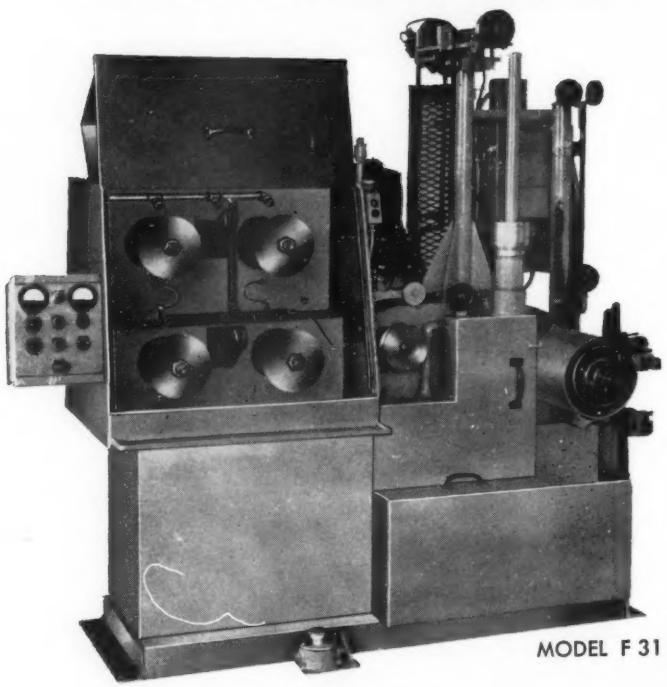
FLOOR SPACE only 6.5' x 3'

Heavy steel plate, all-welded construction • One central control panel • Over-driven spooler prevents slip and wear on finishing capstan • No scuffing or splintering of finished wire • Maintains uniform wire speed throughout entire spooler build-up • Wire tension can be regulated while machine is in operation • Die arrangement permits full horizontal string-up • Provides continuous run of clean, uniformly annealed wire in a complete range of sizes • Prevents wire discoloration • Eliminates double handling of wire and spools • Saves time because annealed wire is available when drawn • Runs efficiently at high speed • No power waste; no warped spools • Spare parts and machine service always available • Will give many years of trouble-free (24 hour-a-day) service at low operating and maintenance cost • This easy-to-operate machine is supplied complete with main drive motor and fully wired controls

ANNEALER ALSO AVAILABLE AS A SEPARATE UNIT ADAPTABLE TO OTHER MAKES OF DRAWING MACHINES

Annealer drive and control, including transformer, are an integral part of Model F31A . . . illustrated

You will recognize this as a greatly improved version of the famous, original COOK DRAWER-AND-ANNEALER



MODEL F 31 A

MACHINE SPECIFICATIONS

Maximum wire entering size . . . #14 B&S gauge • Finished wire size . . . #26 to 34 B&S gauge • Operating speed . . . 4,500 ft. per minute • Maximum number of dies . . . 16 • Number of drawing shafts . . . 4 • Size of die case . . . 1" x ½" thick • Motor size . . . 15 HP • Spool capacity . . . 40 to 90 lbs. • Spool flange diameter . . . 8" to 12" • Spool traverse . . . 6" to 8"

ANNEALER SPECIFICATIONS

Wire range . . . #26 to 34 B&S gauge • Electrical supply . . . 7.5 K.V.A. single phase • Power consumption relative to wire size

Call or write to COOK Manufacturing Co.

50 E. 25th ST., PATERSON 4, N. J., ARmory 4-6380

Wire and cable processing and fabricating machines

WEST COAST: THOMPSON ASSOCIATES, PALOS VERDES ESTATES, CAL. — CANADA: E. V. LARSON CO., LTD., TORONTO
IN EUROPE: CAPAMADJIAN LE MONNIER CIE LTD., PARIS, FRANCE — CAPPY, G.m.b.H., STUTTGART, GERMANY

have established indisputable superiority

Today, as always, product quality is designed and built into every instrument. Our constantly expanding team of engineers and technicians, guided by the experience of forty years, and augmented by competent, modern electronics engineering "know-how," have refined our already famous Class "C", "LO" and "HO" wire sparkers, and have thereby created new standards of excellence and performance.

These modern instruments have been in operational use for over two years and have been approved and accepted by the world's largest manufacturers of insulated wires.

SAFE, LOW SECONDARY test currents of less than 10 milliamperes inspire operator confidence and make insulation damage upon location of faults a "thing of the past."

PLUG-IN ELECTRONIC DETECTION UNIT simplifies service and maintenance while obviating need for lost time.

SENSITIVITY features leave nothing to be desired.

Call or write for complete details in our specification 8A. — You'll be pleasantly pleased.

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Over 40 years of dependable service
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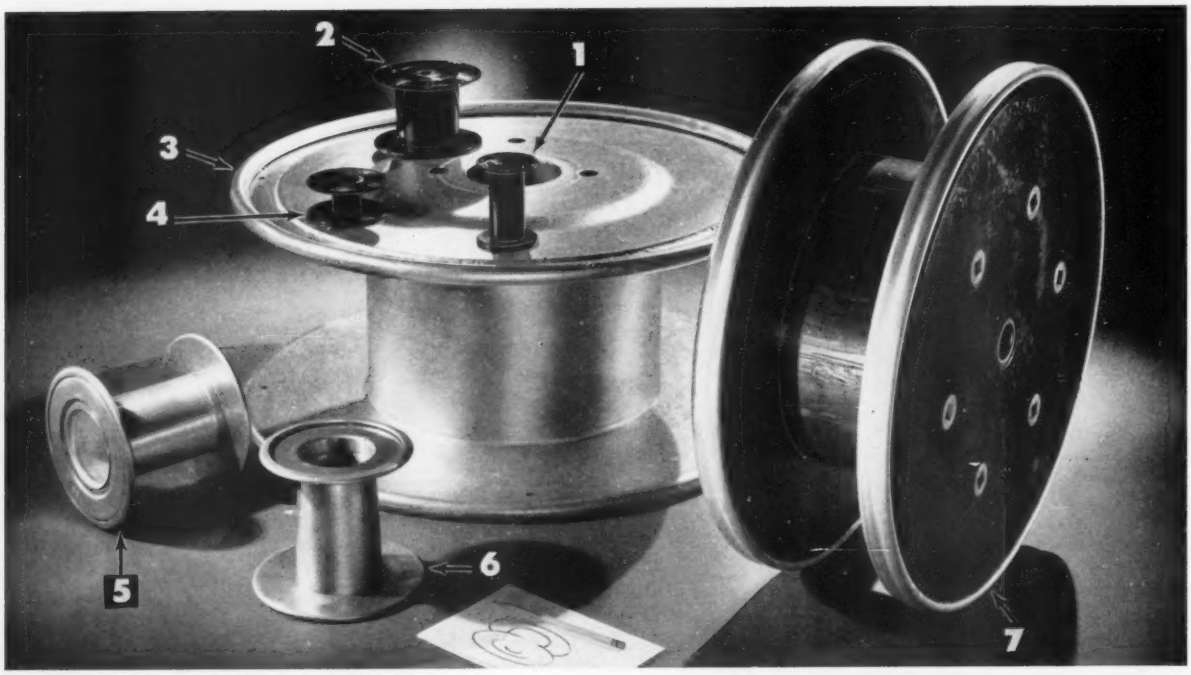
WE'LL DESIGN A SPOOL TO FIT *Your* NEEDS



1 3" Magnet Wire Plastic Shipping Spool

2 6" Magnet Wire Plastic Shipping Spool

3 Heavy Duty Wire Drawing and Processing Reel

4 Weld Wire Spool

5 Standard 8" x 6" x 3" Aluminum Processing and Shipping Spool

6 Aluminum Tapered Barrel Processing and Shipping Spool

7 Standard Wood-Metal Shipping Reel

HUBBARD announces a new Engineering Service for Designing and Developing methods of packaging wire in various shapes and dimensions.

Spools and Reels can be supplied in any size from 2½" to 72" in diameter in a wide range of materials — wood, plastics, steel, aluminum, paper or combinations thereof. Spools made in standard constructions or to your special specifications.

HUBBARD has an accumulated half-century of experience and is equipped with the tools and "knowhow" for the most versatile wire packaging problems. Merely jot down pertinent data and send them to:

Special Engineering Service

HUBBARD SPOOL DIVISION

VN *Van Norman Industries Inc.*

TELEPHONE FL 7-5141

GARRETT, INDIANA

West Coast Representative:
THOMPSON ASSOCIATES
Box 1143, Palos Verdes Estates, Calif. Phone: FRontier 7-4042

The Wire Outlook

Severe temperatures, extraordinary snowfalls and strikes produced marked adverse effects on business in January and February, affecting both production and buying. The worst of this now is behind us, we hope, and the growing optimism soon will be able to become manifest in many segments of the economy.

Inventory adjustments have about been completed, which in itself should contribute to more normal purchasing. There is growing evidence that a turn in the tide of from liquidation to accumulation is occurring now in many quarters — although not in all yet.

Majority opinion presently places the upturn in business in the second quarter of the year, in spite of a continuing decline that has been all too evident. A number of factors contribute to the better outlook. Government outlays are being increased, although this would have taken place regardless of the outcome of the election. Personal income, while it has not grown in recent months, is just under $410 billion, and this provides a strong underpinning for good retail sales. Housing starts are slightly over those of 1960 and will improve as the weather permits. Farm income, somewhat better in 1960 than at first believed, should show a rise in 1961. And steel production is expected to rise moderately.

Plant and equipment investment will not be as good as last year, but if depreciation reforms are put through, as seems possible, this picture may change before the year is out. Nevertheless the actual decline in new plant and equipment expenditures has been surprisingly small, considering conditions.

Many of the new president's pet welfare projects, after some opposition, are likely to be enacted — aid to depressed areas, bigger housing projects, broadened social security benefits, aid to the aged, and higher pay to those out of work. All these, together with anticipated wage increases, are going to push up both taxes and prices, thus further widening the gap between foreign low-wage products and our own. The fact that a lot of glib professors, impractical advisers and former New Deal people are sitting in at the counsel tables is not going to help build a sound economy, despite any outward show of heightened activity.

A number of steel and wire executives feel that the recession has about burned itself out and are looking forward confidently to an upturn. Improved demand for merchant wire products is forecast, orders for manufacturers' wire have grown, specialty wire is moving better, concrete reinforcement and wall mesh sales are reasonably good and soon should be better. Brass mills expect that 1961 business will be up around 10 percent. In 1960 imports of foreign-made brass products fell off by approximately this same amount.

Canadian wire mills have been experiencing a curtailment of shipment, more or less paralleling business here in round steel wire, welded and woven mesh, fencing and nails, the drop from 1959 to 1960 being approximately 10 percent.

Senator Prescott Bush has introduced a bill, No. S.581, that if passed, will do away with sales and use taxes imposed by States on sales and other business activities in interstate commerce. At present the current situation requiring manufacturers to collect and pay such taxes on out-of-state sales causes much additional bookkeeping and trouble. This is a good time to urge your Congressional representative to support the bill.

The recession, the mildest of the post-war years, is undoubtedly on its last legs. While business is still drifting, it should not be long before the country can breathe more easily as a result of a genuine upward trend.

Edmund D. Sickels

EDITOR

HIGHER PRODUCTION --BETTER FINISH --longer die-life with MOLY SOAPS and LUBRICANTS by STEELSKIN

Tests in the lab, trial and experience in the field have proved conclusively the ***Molysulfide*** ® permits a dramatic increase in wire drawing speeds . . . *resists the higher frictional heat thus generated without breaking down!*

FIELD REPORTS TELL US:

1. "Moly lubricants lower friction."
2. "Moly lubricants reduce die wear."
3. "Moly lubricants extend film life."
4. "Moly lubricants increase load capacity."
5. "Moly reduces wire temperatures and improves physicals."

STEELSKIN CXFR POWDER

Using the famous and versatile Steelskin CXH as the lubricant base, this molybdenum disulfide-bearing newcomer bids well to gain equal stature. Inquire about CXFR for your operation.

Our own tests have shown that the greater the moly content, the less the danger of wear and seizure. That's why all R. H. Miller moly lubricants carry the highest possible content of ***Molysulfide*** ® *compatible with the function of the end use of the finished wire.* Put our experience with ***Molysulfide*** ® to work in your wire production.

Ask your R. H. Miller field man about our new moly lubricants and write us for complete information on the use of moly in your particular wire drawing application.

Steelskin
REG. U.S. TRADE MARK

R. H. MILLER
COMPANY, INC., Homer, N. Y.

METAL WORKING LUBRICANTS

WIRE
AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 36 MARCH, 1961 No. 3

Do Molybdenum Disulfide-Containing Wire Drawing Lubricants Have a Place in Your Mill?

by

Walter A. Smigel
Executive Vice President
and General Manager
R. H. Miller Company
Homer, New York

and

William M. Stillwell
Manager, Lubricant Sales and Development
Climax Molybdenum Company
Division of American Metal Climax, Inc.
New York, New York

WALTER A. SMIGEL

Mr. Smigel is General Manager and Executive Vice President of the R. H. Miller Company, Inc. He has had twenty-eight years experience in the lubrication field. He joined the C. H. Clark Oil Company of Cleveland, Ohio, in 1933 after graduating from the Case Institute of Technology with a degree in Chemical Engineering. He later was employed as Lubrication Engineer by the Chase Brass & Copper Company at their Cleveland Plant and served as Consulting Engineer to the R. H. Miller Company, Inc. for a number of years before becoming General Manager in 1940. He was named Executive Vice President in 1960.

The advantages and disadvantages of this new lubricant additive, which has proven successful in many wire drawing applications, are set forth in this article.

In their continuing efforts to cooperate with wire-drawing companies to obtain the higher drawing speeds, longer die life and improved finishes necessary to compete effectively in the market place today, lubricant suppliers have been developing a number of specially prepared wire-drawing compounds that incorporate various lubricant additives.

* * *

Among the more promising of these additives is molybdenum disulfide. Used in wire-drawing lubricants, it has proven successful by a number of companies producing a variety of products that include wire rope, extruded welding wire, stainless steel wire, coat hanger wire, aluminum core wire, many kinds of high carbon wire, spring wire, specialty metal wires, chain link fence wire, galvanized and other process wires.

* * *

The low coefficient of friction of Molysulfide® has been known for many years. This knowledge was of little consequence until recently, however, since almost no one seemed to consider the material technically or economically usable as an ingredient in wire drawing

® Molysulfide — Registered Trademark of American Metal Climax, Inc. for its molybdenum disulfide.

WILLIAM M. STILWELL

Mr. Stilwell is manager of lubricant sales and development at Climax Molybdenum Company, a division of American Metal Climax, Inc. He received a Bachelor of Arts degree from Yale University in 1951. After serving in the U. S. Navy, he joined Climax in 1955 as assistant budget officer and later became assistant manager of lubricant sales and development. In October, 1960 Mr. Stilwell was appointed manager.

lubricants.

Historical Background of Molysulfide

The potential of molybdenum disulfide as a wire-drawing lubricant additive was first formally suggested by **R. E. Griffith** in September 1950 in a discussion following a technical paper delivered before a meeting of the American Iron and Steel Engineers. Results of his research revealed that the material exhibited structural properties which suggested possible application in extreme pressure lubrication, such as is encountered in the cold reduction of metals. He concluded that while the results obtained were encouraging and it was possible to draw wires in a number of successive drafts, the cost of the product was quite high in comparison with usual lubricants. As a result, until 1956, molybdenum disulfide was used only in relatively small quantities as an additive agent to wire-drawing powder principally for cold reducing stainless steel.

* * *

Early in 1956, a company drawing titanium and other similar metals, discovered that the addition of molybdenum disulfide to a specially formulated metallic soap wire-drawing lubricant was helpful. Shortly thereafter, a product was developed which was based on the previous formulation, but with Molysulfide incorporated into the fused mixture. The product was tested and found to exhibit superior performance. As a result of this special treatment, this new product opened up many new uses for Molysulfide-bearing wire-drawing lubricants.

Mixing Process Variables

In dry wire drawing, the heat and pressure of the drawing operations transform the lubricant and carrier into a plastic-like film which serves to reduce friction and minimize metal-to-metal contact. This prevents scratching and increases die life.

* * *

The chemical composition of a particular lubricant, however, does not entirely determine its efficiency for a specific application. A lubricant with its components mechanically mixed, for example, will give different performance characteristics from one in which some of the components are chemically or thermally fused into a solid of uniform composition, and then ground. Other variations in manufacture will produce different lubrication properties in compounds having the same chemical analysis.

* * *

Some users have added Molysulfide mechanically with success to wire drawing lubricants suitable for an intended application. Experience indicates that inert Molysulfide incorporated in a chemically or thermally fused carrier will form a more uniform and continuous protective plastic-like film between the wire and die, and will give the best results.

Price vs Productivity, Quality

Users of wire-drawing lubricants generally are interested in formulation changes only if:

1. **They improve the quality of the wire, or**
2. **They offer a cost reduction to the wire mill through an increase in drawing speed, better die life, less downtime due to scratching and out-of-round wire, reduction in rejects, and/or the reduction of electric power.**

* * *

The use of Molysulfide almost always increases the cost-per-pound of the lubricant. In many cases, however, the increase in the lubricant cost has proven to be insignificant in comparison to the overall savings effected.

* * *

Where improved quality is concerned, there has been a surprising number of excellent results, and some unexpected results have been discovered. The following are among the more recent such experiences:

Performance Achievements

Coat Hanger Wire—Many major wire producers have adopted a Molysulfide-filled soap-grease mixture as a wire-drawing lubricant. In some cases die life has been increased up to 50 per cent. This, combined with higher speeds and less downtime, has resulted in lower operating costs, along with impressive improvements in the smoothness of wire.

* * *

Wire Rope — After many months of field evaluation, the Wickwire Spencer Division of Colorado Fuel & Iron Corporation has standardized on a high molybdenum disulfide-bearing metallic soap powder which has increased wire rope wear life and toughness.

* * *

Welding Rod — In the production of core wire for coated welding electrodes, Westinghouse Electric Corporation in Montevallo, Alabama, found that a molybdenum disulfide grease increased drawing speeds by 25 to 40 per cent and extended die life. In the beginning, Westinghouse engineers were concerned about the possibility of sulfur pick-up from the molybdenum disulfide in the lubricant. Thorough testing, however, revealed that pick-up was negligible and has no adverse effects on coating or weldability.

* * *

Aluminum Core Wire — Tests conducted on a 0.70 carbon steel for aluminum core wire revealed that the wire drawing speed of a five-hole Vaughn machine running lime coated rod to 0.103″ was increased from 800 fpm to 1,500 fpm by the addition of a Molysulfide lubricant. During the trial run, 20 bundles of wire were drawn with only 0.0002″ wear on the finishing die.

* * *

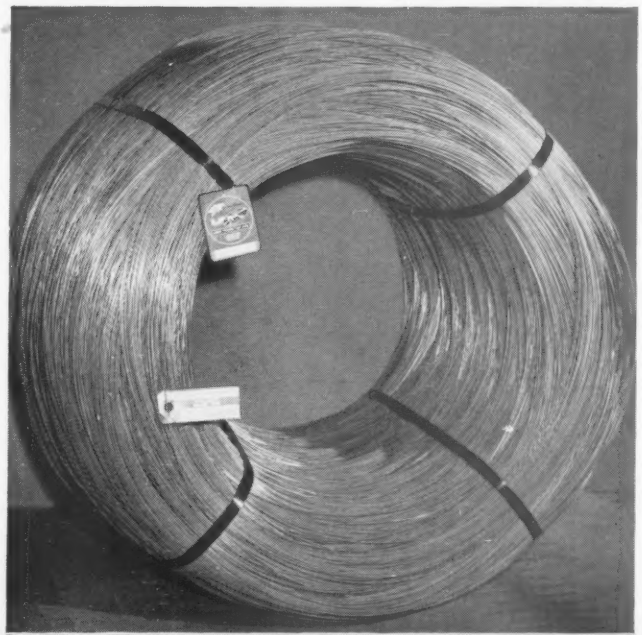
Nail Wire — Production experience by a major company indicates that a Molysulfide lubricant has eliminated nail cutting problems in drawing descaled rod.

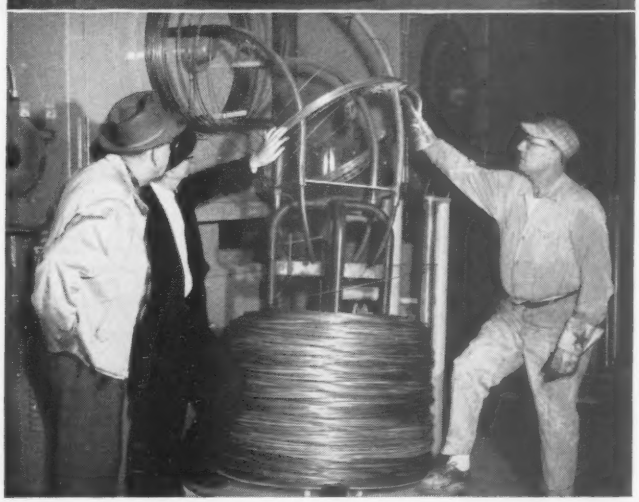
* * *

Nuclear Type Wires — Armetco Corporation, which possesses a wide variety of difficult-to-work materials such as nuclear, reactive and refractory type metals, has improved drawing results immeasurably by dip coating Molysulfide suspended in a combination of carrier lubricant-type chemicals. The company is also using dry wire-drawing lubricants containing a high percentage of Molysulfide.

(Please turn to page 376)

DSC-PORTSMOUTH "LAYER WRAPPED" LPR® COILS GIVE UPHOLSTERY SPRING MAKER OVER 40 MILES OF NON-STOP FABRICATING PER SETUP





LONG PRODUCTION RUN SNAG-PROOF COILS AVERAGE OVER 2200 LBS. .076″ HIGH CARBON WIRE

Improved "Layer Wrapping" Method Steps Up Fabricating Efficiency

DSC-PORTSMOUTH DIVISION, Rod and Wire Department, recently began producing and shipping .076″ Upholstery Spring Wire in Long-Production-Run coils averaging over 2200 pounds in weight and over 40 miles in continuous length. One of these coils is shown in the adjacent photograph.

LONG PRODUCTION RUN COILS are not new. For years we have been regularly producing LPR's weighing up to about 4200 pounds. But it is something like crashing a "New Frontier" to produce spring wire LPR's as light as .076″ in gauge and weighing over a ton — ***and packaged in a way that virtually eliminates the chance of snagging or tangling in your pay-off operation.***

THIS CONTRIBUTION to WIREWORKING EFFICIENCY is one important result of ***"layer wrapping" the strands as the big coils are built up.*** This mill operation is shown in the lower photograph.

Would cost-reducing, Long-Production-Run, snag-proof coils fit into your brite wire fabricating picture? ***For the complete story on LPR's and "layer wrapping", and answers to your questions regarding application, size-weight ranges and prices, call your DSC Customer "Rep" or write: Detroit Steel Corporation, Box 7508, Detroit 9, Michigan.***

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The Color Reflectometer; An Instrument for the Continuous Measurement of the Color and Reflectivity of Fine Wire

by

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Theodore L. Weaver **is a graduate of the Williamsport Institute of Technology and worked in electronics and television prior to joining Sylvania in 1957. At Sylvania he has been engaged in studies on particle size analysis, refractory metal powder properties and nondestructive test instrumentation.**

Allan I. Michaels

Allan I. Michaels **received his B.S. in Physics from the City College of New York in 1954 and has done graduate work at Columbia University. He joined Sylvania in 1956 and was active in research on particle size and distribution determinations, the properties and processing of refractory metals and nondestructive test instrumentation. Mr. Michaels joined the Applied Research Section of the Westinghouse Lamp Division in May, 1960, and is presently engaged in research on electroluminescent thin films. He is also doing graduate work in Physics at the Stevens Institute of Technology.**

Russell C. Nelson

Russell C. Nelson **received his B.S. degree in Metallurgical Engineering from Lehigh University in 1948, and his M.S. and D.Sc. degrees from the Colorado School of Mines in 1949 and 1951 respectively. He joined the Chemical and Metallurgical Division of Sylvania Electric Products Inc. in 1953. Since that time he has been actively engaged in research and development on both the extractive and physical metallurgy of tungsten and molybdenum, and is presently Head, Metals Research. Prior to joining Sylvania, Dr. Nelson was employed at the Oak Ridge National Laboratory on the processing of uranium raw materials and the development of high temperature ceramics.**

An instrument is described to continuously and nondestructively measure the color and reflectivity of the surface of a rapidly moving fine wire. Included are block and circuit diagrams as well as a discussion of the principles and the operation of the instrument.

Results are reported on a test of the Color Reflectometer for the measurement of the color of the oxide coating placed on the surface of a tungsten wire prior to its being coated with a graphite lubricant in the wire drawing process. Color changes were detected with a sensitivity sufficient for control purposes.

Data are also presented which show the instrument's capability for measuring the reflectivity and uniformity of graphite coatings on fine wire.

The article is so written that a reader can construct an instrument for his own use.

Introduction

The results of earlier (unpublished) research had established the existence of a relationship between the color of the oxide substrate and the adhesion of the graphite lubricant for the tungsten wire-drawing process in the 1 to 9 mil size range. In order to utilize this relationship for the improvement of quality and uniformity of drawn wire, an instrument was designed and built to continuously and nondestructively make color and reflectivity measurements on the wire during processing. This instrument, which has been named the Color Reflectometer, is sufficiently sensitive to the color changes involved to control the process automatically. In addition, small differences can be measured in the reflectivity and surface uniformity of graphite coatings on fine wire. A great many other applications are probable.

Description of the Instrument

The Color Reflectometer consists basically of a system for pulsing and reflecting blue light alternately from a standard wire and a moving test wire, and a photomultiplier tube detector which measures the difference between the intensities of the two reflections. The difference in intensity is proportional to the amount of blue color (with a lesser contribution from general glossiness) in the coating on the test wire as compared to the standard wire.

* * *

Figure 1 is a photograph of the complete instrument. The unit on

* Now Research Engineer Westinghouse Electric Corp., Lamp Div., Bloomfield, N. J.

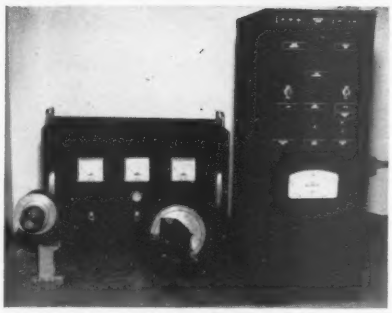
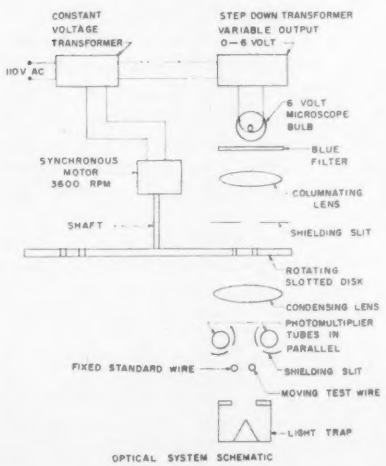


Fig. 1 — The Color Reflectometer. * * *

the left is a dual (high and low voltage) power supply with both high and low voltage meters and a milliamp meter on its front panel. On the right is seen the unit containing the optical, wire guide, detection and measuring sections. The large front panel meter indicates the average difference in the pulse heights of the standard and test wire reflections. A jack output for displaying the actual pulses on an oscilloscope is provided, and also (not shown) jacks for recorder or controller outputs. In this photograph a test wire is seen passing through the instrument from left to right.

* * *

The most important section of the Color Reflectometer is the optical system, illustrated in Figure 2. From top to bottom are: (1) a small light bulb with a rectangular shaped filament, for which the power is furnished by a constant voltage supply and a transformer; (2) a narrow band blue light filter; (3) a columnating lens which produces a parallel beam of light; (4) a variable shielding slit to shape the beam into a thin rectangle of light; (5) a rotating slotted disc (driven by a 3600 RPM synchronous motor synchronized to line frequency) in which alternate slots are offset from each other to produce two separate beams of light which are pulsed alternately at 120 pulses/second for each beam; and (6) a condensing lens to bring the two beams to focus on the standard and test wires respectively. The light beam which is alternately reflected from each of the wires strikes the two photomultiplier tubes (connected in parallel) located above the wires. Two tubes are used to equalize the proportion of the reflected light from each wire which is detected by the tube cathodes. Light which by-passes the wires enters a light trap which prevents its being reflected back to the photomultiplier tubes. The moving test wire is guided into and out of the measuring region by glass capillary tubes with flared end openings. The section of wire being measured (about one inch long) is the only unguided length, and is thus practically vibration free. This system produces a series of light pulses, falling on the photomultiplier photosensitive cathodes, which are alternately reflections from the standard and test wires.

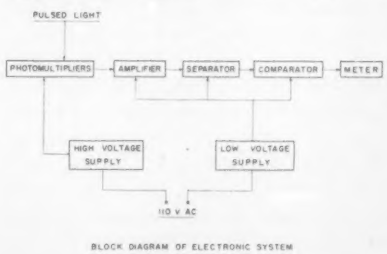


OPTICAL SYSTEM SCHEMATIC

FIG. 2

* * *

The photosensitive cathodes emit bursts of electrons proportional in magnitude to the intensities of the light pulses. By employing voltage acceleration of the electrons followed by collision with a target and secondary electron emission, these electron currents are amplified in the ten stages of the tubes by a total factor of about one million (with approximately 100 volts per stage placed on the tubes). The amplified signals are then handled as shown in the Block Diagram of Figure 3. Reading from left to right, the signals from (1) the photomultipliers are further amplified in (2) a high gain amplifier which also clips them to increase the signal-to-noise ratio, and then are fed to (3) a separator which separates alternate pulses so that all standard wire pulses appear at one point, all test wire pulses at another. The separated pulses are then sent to (4) a comparator where the difference in magnitude between corresponding standard and test pulses is obtained. This difference is averaged, and then measured in (5) a vacuum tube voltmeter which gives a readout as the average D.C. level for either a meter or recorder. The dual power supply has a high voltage, low ripple, stable but unregulated output which places 1100 volts D.C. across the photomultiplier tubes, and a second very well regulated 250 volt D.C. output for the tubes in the various detection and measuring sections.



BLOCK DIAGRAM OF ELECTRONIC SYSTEM

FIG. 3

* * *

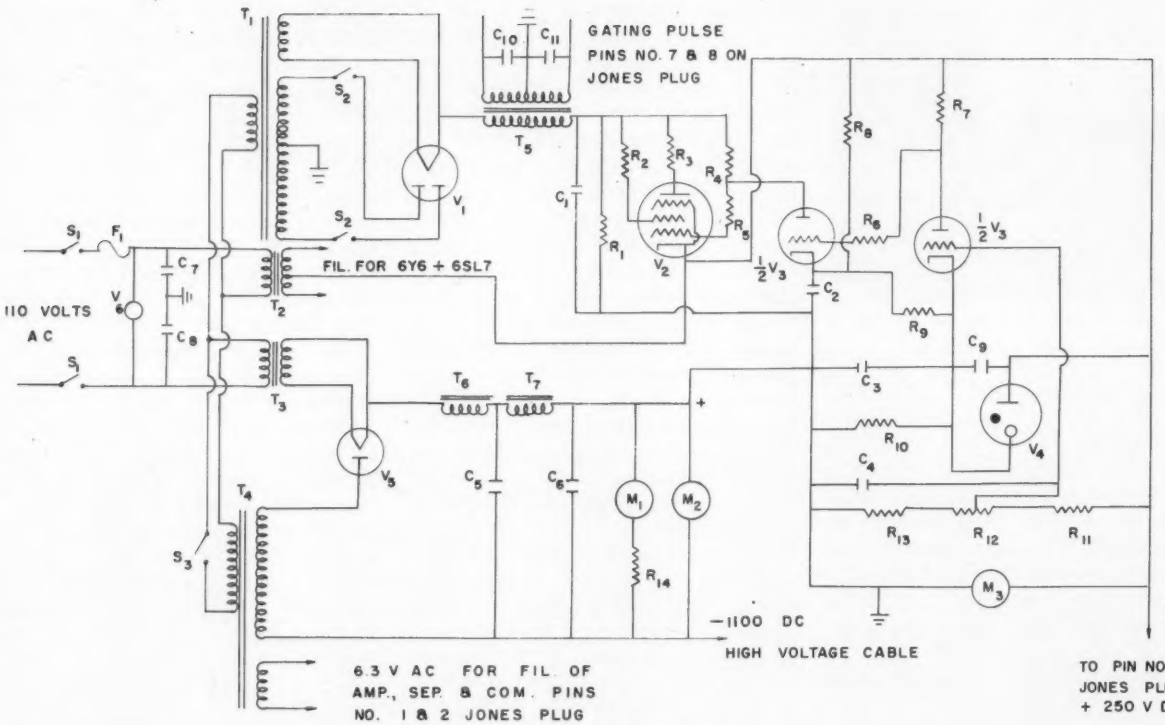
The circuit diagram for this dual supply is given in Figure 4. The high voltage section (at the bottom left) has a choke input and two filter stages to provide a low ripple output of 1100 volts D.C. (below ground potential). The low voltage regulated supply section has an adjustable output with a negligible change for input variations from 80 to 130 volts and for load variations from 0 to 80 milliamps. An 0C3 voltage regulator tube provides a constant voltage reference point for this supply. The parts list for Figure 4 is given in Appendix A.

* * *

Since the high voltage supplied to the photomultipliers is not regulated, individual regulation is provided on each stage of these tubes by means of neon gas glow discharge NE-2 bulbs. These maintain a constant voltage drop of about 100 volts across themselves for a wide range of currents. A filter system (not shown) by-passes most of the NE-2 noise and the photomultiplier dark current to ground. The arrangement used is shown in Figure 5.

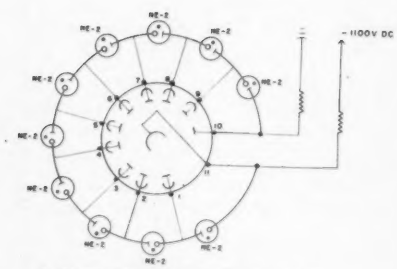
* * *

The circuit diagram for the measuring section including the separator, comparator and vacuum tube voltmeter is given in Figure



DUAL POWER SUPPLY

FIG. 4



PHOTOMULTIPLIER SECTION

FIG. 5

APPENDIX A

Parts List For Power Supply, Figure 4

V_1 - 5U4GA	C_1 - 40 mfd 400 V. DC
V_2 - 6Y6G	C_2 - 500 mmfd
V_3 - 6SL7G	C_3 - 8 mfd 400 V. DC
V_4 - OC3	C_4 - .25 mfd 600 V. DC
V_5 - 866A	C_5 - 15 mfd 1000 V. DC
	C_6 - 15 mfd 1000 V. DC
S_1 - DP/ST	C_7 - .02 mfd 600 V. DC
S_2 - DP/ST	C_8 - .02 mfd 600 V. DC
S_3 - SP/ST	C_9 - .25 mfd 600 V. DC
	C_{10} - .5 mfd 600 V. DC
R_1 - 470 K Ohms	C_{11} - .5 mfd 600 V. DC
R_2 - 47 Ohms	
R_3 - 47 Ohms	T_1 - Pwr. Trans.(Stancor PM 8411)
R_4 - 470 K Ohms	T_2 - 6.3 V. CT Fil. Trans. (Stancor P 6134)
R_5 - 470 Ohms	
R_6 - 470 Ohms	T_3 - 2.5 V. 5A Fil. Trans. (Stancor P 6133)
R_7 - 470 K Ohms	
R_8 - 22 K Ohms	T_4 - Pwr. Trans. (Stancor PC 8416)
R_9 - 10 K Ohms	T_5 - Choke with Secondary CT
R_{10} - 10 K Ohms	T_6 - 8.5 hy 200 ma.(Stancor C 1721)
R_{11} - 112 K Ohms	T_7 - 8.5 hy 200 ma.(Stancor C 1721)
R_{12} - 100 K Ohms Pot.	
R_{13} - 100 K Ohms	M_1 - 0-100 ma. DC
R_{14} - 50 K Ohms	M_2 - 0-2000 V. DC Triplett 227-PL
	M_3 - 0-300 V. DC
V_6 - 115 V. Lamp	
F_1 - 10 amp Fuse	

6. The series of pulses from the photomultipliers are fed to the grid of the preamplifier tube. Here the pulses are inverted (to positive pulses), amplified and clipped, and then fed to the two plates of the separator tube. An oscillating gating signal placed on the grids of this double tube drives one grid positive, and the other negative and then reverses. As each grid becomes positive, the plate to ground resistance approaches zero (the plate is shorted to ground) and the pulse appearing at the plate of this half of the tube disappears, the pulse at the other plate still remaining. The gate is synchronized with the light chopper (rotating disc) so that one plate is always shorted to ground when standard wire pulses are on the two plates, and the other plate is shorted whenever the test wire pulses appear. Thus, the former plate holds only test wire pulses, the latter plate only standard wire pulses. These plates in turn are connected to the grids of another dual tube functioning as a comparator. The wire pulses are reproduced at the cathodes of this tube, and then impressed across a pair of condensers connected from cathodes to ground. The condensers serve to average the pulses. The net voltage from the positive side of one condenser to the positive side of the other, or from one cathode to the other, is proportional to the difference in the magnitude of the light reflected by the two wires. This net voltage difference is fed into a vacuum tube voltmeter where its magnitude can be measured on a meter, a recorder, or a controller. The parts list for Figure 6 is given in Appendix B.

* * *

An additional wiring diagram, given in Figure 7, shows the Jones plug connections for the cables which carry the power supply outputs to the measuring section.

Performance of the Instrument

The Color Reflectometer was designed with the objective of measuring and controlling the color of the oxide coating placed on tungsten wire prior to its being coated with graphite in the wire drawing process. This was desirable since it had been indicated in previous

APPENDIX B

Parts List For Measuring Section, Figure 6

V_1 - 6AK5	J_1 - Test Jack
V_2 - 5814A	J_2 - Test Jack
V_3 - 5751	J_3 - Test Jack
V_4 - 5751	J_4 - } Output for controller
	J_5 - } or recorder
R_1 - 270 K Ohms	
R_2 - 430 Ohms	C_1 - .5 mfd 400 V. DC
R_4 - 1.2 Meg. Ohms Pot.	C_2 - 16 mfd 150 V. DC
R_5 - 100 K Ohms	C_3 - 16 mfd 150 V. DC
R_6 - 100 K Ohms	C_4 - .02 mfd 600 V. DC
R_7 - 2 meg. Ohms	
R_8 - 2 meg. Ohms	M_1 - 100 - 0 - 100 microamp
R_9 - 1 meg. Ohm Pot.	
R_{10} - 3.9 K Ohms	C_{10} - .5 mfd 600 V. DC
R_{11} - 1.4 K Ohms	C_{11} - .5 mfd 600 V. DC
R_{12} - 3.9 K Ohms	
R_{13} - 1 meg. Ohm	

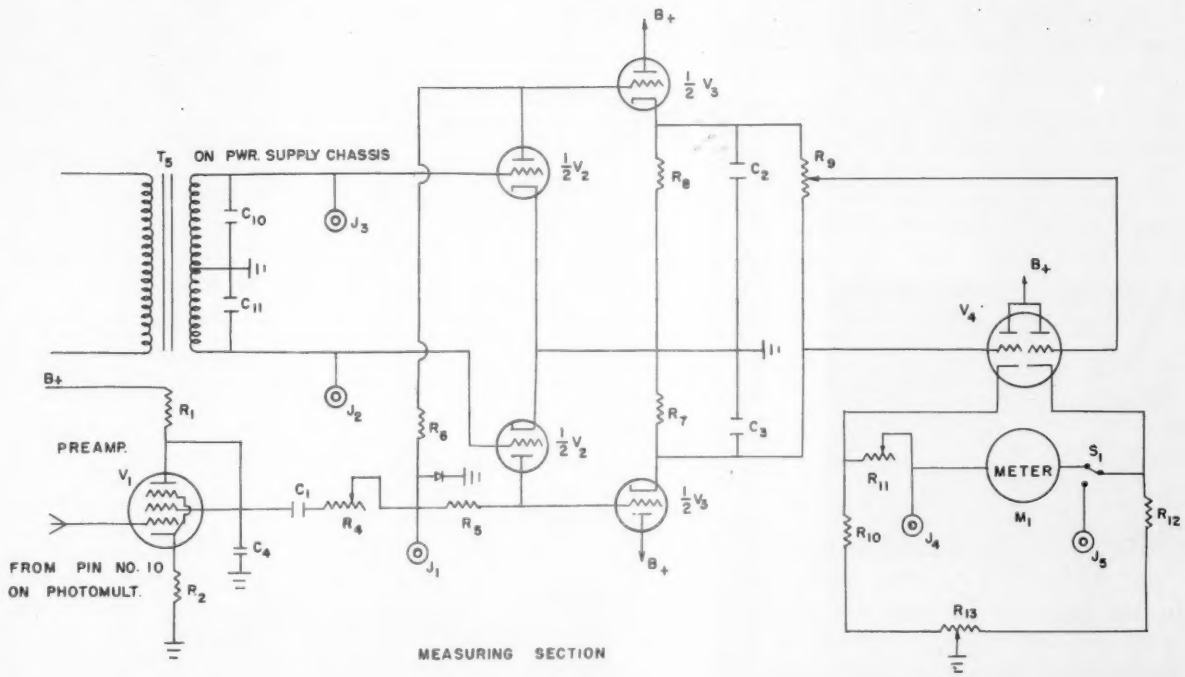


FIG. 6

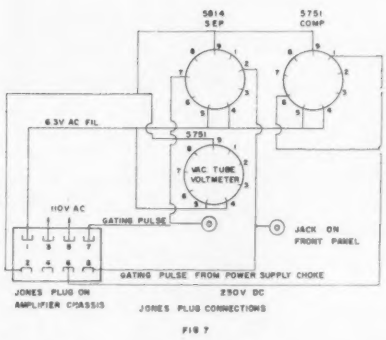


FIG 7

investigations that the color of the oxide sub-layer strongly influenced the adherence of the graphite. Consequently, an experimental 7.5 mil wire drawing line was constructed, and used to test the instrument. A Block Diagram of this set up, showing the location of the Color Reflectometer, is given in Figure 8. From left to right are: (1) an unspooling and back tension device; (2) an annealing and cleaning furnace, with molybdenum strip heaters and hydrogen atmosphere; (3) an oxidizing furnace which uses self resistance heating of the wire via mercury pool contacts and a DC or AC supply; (4) the Color Reflectometer with power supply and recorder; (5) a graphite fountain; (6) a gas-flame baking furnace; (7) a second graphite fountain; (8) a gas-flame drawing furnace; (9) drawing die with a gas-flame heater; and (10) a spooling device.

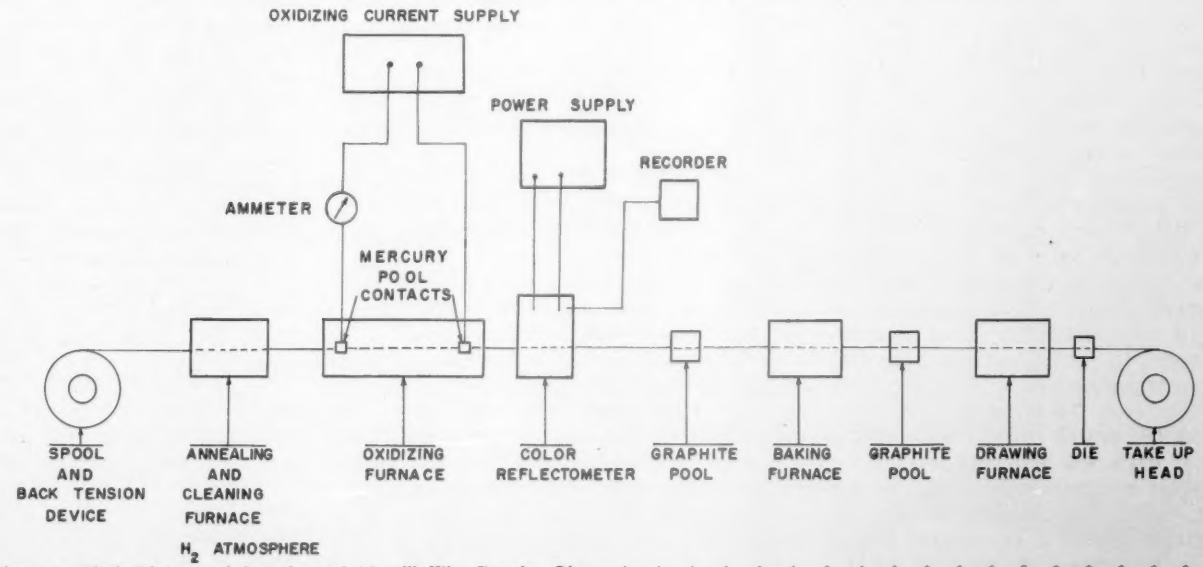


Fig. 8 — Block Diagram of Experimental 7.5 mill Wire Drawing Line.

A photograph of the actual arrangement used is shown in Figure 9. The recorder is on the left. Behind it, and immediately to the right is the oxidizing furnace with a power supply above it. Further to the right is the Color Reflectometer and its power supply with an oscilloscope above it for pulse display purposes.

Fig. 9 — Experimental Wire Drawing Line.

In the tests which were performed, all factors in the wire drawing line were kept constant except for the oxidizing current, which was varied to produce a wide range of oxide colors. The color corresponding to a given current was identified by stopping the drawing and removing a sample of the wire for examination under a binocular microscope. At the same time, a recording was made of the output signal developed in the Color Reflectometer for each different color. After numerous preliminary trials, two final runs were made. In the first run the oxidizing current was supplied through an AC Variac and was not held constant. The measurements obtained under these conditions are shown in Figure 10A. It will be noted that the oxidizing current varied ± 0.01 to ± 0.02 amps (currents are marked on the chart), while the Color Reflectometer output readings oscillated about ± 1.0 volt. (One major division on the recording chart equals 1.0 volt of output). In spite of these oscillations, a clear distinction was observed between colors, and excellent reproducibility was demonstrated in the repeats of blue and brown colorations.

* * *

A DC power supply, with which the oxidizing current could be closely controlled, was used for the second run to obtain a more exact determination of the sensitivity of the instrument to changes in the oxide color. The result is given in Figure 10B. It was possible under these conditions to distinguish clearly at least eight oxide colors. A change from deep blue (believed to be the correct color for maximum graphite adherence) to blue, gives a 1.0 volt increase in output, while a change to purple results in a 1.5 volt drop. Since a few millivolts is often sufficient for control purposes, the sensitivity of the instrument appears to be more than adequate.

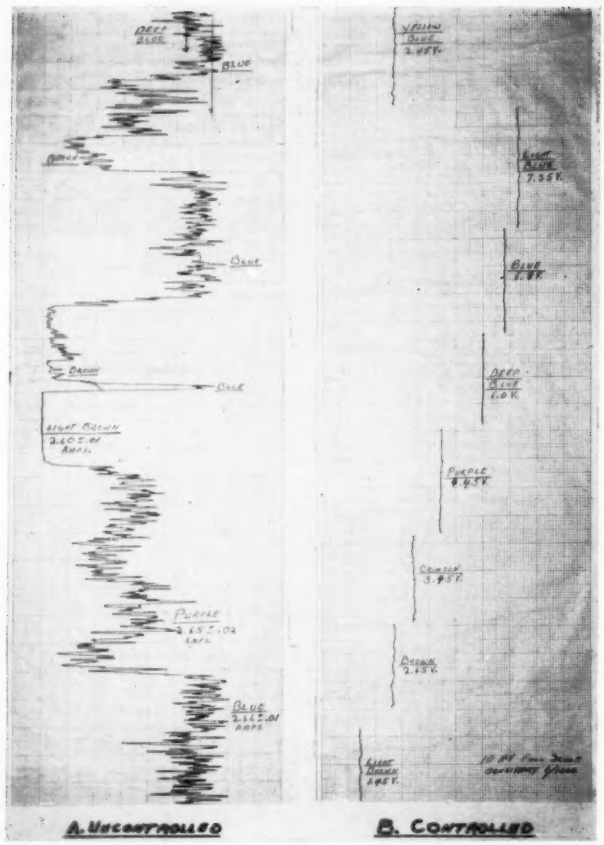


Fig. 10 — Oxide Color Measurement.
a. Uncontrolled
b. Controlled

* * *

The average amount of light that is reflected by a coating can be affected by two main factors. The primary one is the color of the coating, as was demonstrated in the previous measurements. Since the instrument is highly sensitive to blue light, it will indicate a much greater reflectivity for coatings containing larger amounts of blue color. The second factor is the gloss or smoothness of the coating, a higher gloss giving rise to higher reflectivity for coatings of the same color. In addition to these average effects, there are the rapid variations which are due to surface discontinuities.

* * *

Preliminary results on graphite coated (black) wire indicated that the Color Reflectometer could be used to measure the glossiness and surface roughness. In order to explore this application of the instrument, tests were run on two 0.8 mil black tungsten wires which had shown good and bad coiling properties in lamp filament production and on a series of eighteen 3.0 mil tungsten wires which were coated with two different graphite formulas. The results of the former test are given in Table I and of the latter in Table II. The wires were all run at a feed rate of 30 meters/minute.

* * *

In both of the above tests a microscopic examination of the wires revealed no difference in color, indicating that the difference in average reflectivity were due only to the glossiness of the coat-

(*Please turn to page* 375)

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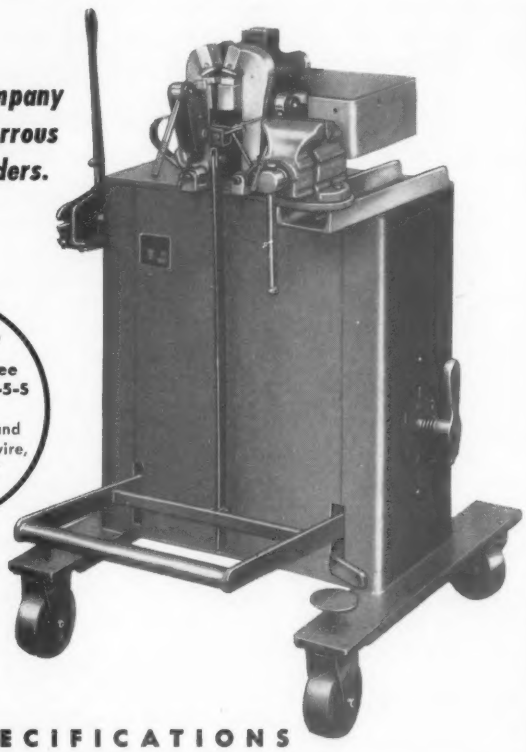

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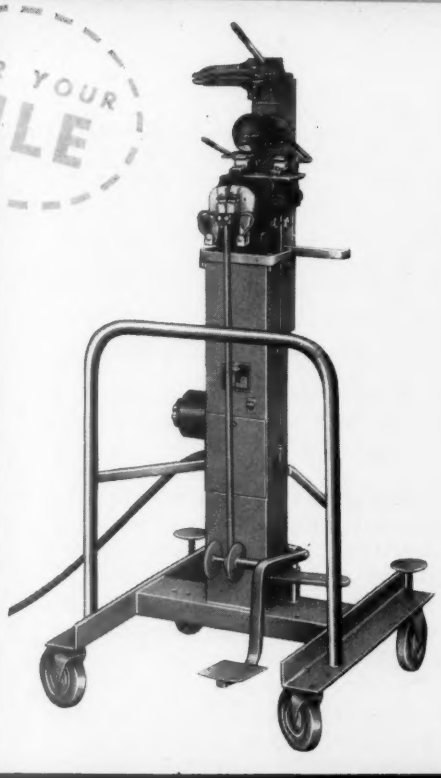

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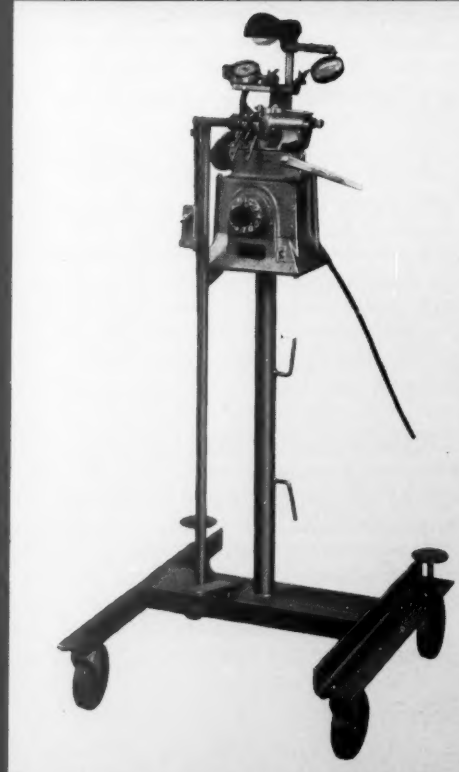
MODEL J-4-S WELDER
Capacity .040" to .160" diameter.
Steel, Steel Alloys, & Thermocouple Wire.

MODEL E-1-S MICRO-WELD BUTT WELDER. MOUNTED ON 4-WHEEL TRUCK
Capacity .010" to .062" diameter high and low carbon steel wire, and alloy wire (thermocouple).



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A.C.M.T.	.010" to .062" diameter
E-1-S	.010" to .062" diameter
J-3-S	.020" to .080" diameter
J-4-S	.040" to .160" diameter
J-45-S	.060" to .200" diameter
J-5-S	.080" to .250" diameter

FOR WELDING FERROUS WIRE & RODS	
MODEL	CAPACITY
J-6-S	.250" to .375" diameter
E	.035" to .225" diameter
T-L	.080" to .375" diameter
T-HD	.125" to .625" diameter
H.T.	⅛" to ¾" diameter
MD-3	.375" to .750" diameter
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Mr. Jubb presented this paper before the Staff School of Frederick Smith & Company Wire Manufacturers Ltd., Halifax, England, for which he received the Second Award in the Technical Section. It is published with the permission and through the courtesy of the Frederick Smith firm.

Quality Control! What is it, and can it be applied to the Wire Industry?

* * *

The object of this paper is to examine the possibility of adopting statistical quality control techniques against a background of the wide variety of processes operated in the manufacture of wire and wire products.

* * *

The writer must state at once that he is not a statistician or a mathematical expert by any means, but rather a "wire man" groping his way slowly but surely into the realms of statistical quality control.

* * *

First it is necessary to examine the general method of producing wire to a customer's specification, the subsequent tests and examinations during production, and the final inspection and passing — or rejecting — of the finished product. To put this in its simplest form, the procedure is a combination of technological methods, and a large amount of "know how" based on past experience.

* * *

The customer's order is examined, the method of production decided upon, and the base material — a rod of known analysis and gauge — is selected. If this process is carried out there should be very little chance of the finished product failing to meet the customer's specification, providing certain precautions are taken.

* * *

Right from the start there must never be any doubt regarding the history of the particular piece of wire in question, otherwise no form of quality control can be successfully operated; this means that the method of identification by labelling has to be first-class. This is not very easy in these days of continuous drawing and galvanising where a batch of wire starts off its life in separate coils, is welded together to produce continuous lengths, cut again into different size coils for transportation to numerous processes, welded again, and finally cut up into further coils.

* * *

It is not always realized that the modern techniques which have speeded up the production processes, reduced costs, and in general simplified the whole manufacture, have tended to eliminate the strict control which was possible when wire was produced in simple rod lengths before the event of welding.

* * *

Quality Control, to be effective, must be operated throughout the manufacture and as close to the different processes as practicable.

Raw Material

Owing to the great advances made in the Industry the demand for a very wide range of finished products has appeared. It has been necessary to break down the raw material into qualities based on a range of analysis, and the variety of rod qualities required has already reached alarming proportions.

* * *

It is, for example, no use setting out to produce a finished wire with a five ton tensile range if the selected cast, let alone the quality grade, will not guarantee this range. This is very often overcome by not specifically producing for an order but rather selecting from a batch of finished wire the small amount which will be in the required range. This is all very well but extremely uneconomical as the ratio between the tons production and the variety of sizes and qualities increases.

* * *

The basis of starting on quality control must, therefore, be largely in the hands of the Rod Mill in that the batches of incoming rods must be of known analysis. The analysis range of each quality must not be too large, otherwise wire produced from two casts at opposite ends of the quality range will be inconsistent. The resultant product will tend to have too great a range even though still within specification. This does happen and as soon as the user realizes it he immediately tightens the specification, thus increasing the difficulties in control and manufacture.

* * *

Throughout the Industry this is largely taken care of by the Rod Manufacturer submitting an analysis of each cast produced, and sample checks are done at random intervals by the Laboratory of the Wire Manufacturer.

* * *

It is from this point that we will start our survey of quality control, having assumed that the foregoing procedure regarding the supply of rods is already in operation.

Wiredrawing

The first process to be considered for quality control is the wiredrawing section, although some measure of quality control can be adopted in the Cleaning House and Pickling Trains, with particular regard to the acids and other chemicals in use.

* * *

In these days of continuous wiredrawing, where single machines or batches of machines are producing similar types of wire, the control can only be operated at the end of

each coil produced. This means testing say every 10-cwts. or 1 ton of production per machine. Where the wire is to be submitted to heat treatment in the subsequent process it is only really necessary to deal with gauge tolerance. For the production of hard drawn mild steel and hard drawn patent steel, this control can be extended to include the physical properties required in the final product, such as breaking load, elongation, torsions, etc.

* * *

The finish of the material can also be studied, but this is not easy to measure or record, and must largely be in the hands of the operative or supervisor, preferably the latter.

* * *

One feature of quality control in wiredrawing must not be overlooked, and that is the question of die life. It is important that the tolerance applied to each separate job, particularly for material that is going to be processed further in the same firm, is sensible and does not enforce too great a strain of the wiredrawer. The technique for dealing with this problem is the same throughout all the processes and it will be dealt with in detail later on in the paper.

Annealing, Galvanising, Etc.

In the process of annealing quality control can be applied to the annealed wire itself, but much greater effect is achieved by applying the control to the actual annealing process. The measurements of temperature, time, gas pressures, analysis, etc., will all help to ensure that the annealing is right the first time.

* * *

We now come to galvanising, which is the process that the writer has studied in great detail, and undoubtedly it is the hardest process to control successfully.

* * *

The two types of galvanising that have been studied are the Tainton Electro-galvanising process, and the more common Hot Dip process. The Electro-galvanising process being a much more flexible system, not only allows quality control to be adopted, but is absolutely essential from an economical point of view.

* * *

It should be noted at this point that whatever is said regarding galvanising, can, of course, be applied to other similar processes such as patenting, tinning, coppering, in fact any part of wire manufacture that is effected on plants running numerous wires at the same time. In these processes everything must be done to ensure that the majority of the material is correct to specification, and on no account must the majority be allowed to suffer for the odd wires that may be giving trouble.

* * *

We have no worries now regarding the incoming wire for galvanising as this has been carefully controlled by the wire-drawing department and therefore further checks at the starting end of the plant are not necessary.

* * *

The wires are welded into continuous lengths and sent through the galvanising train, and at frequent intervals coils are removed at the finishing end, either from the normal horizontal block, or from the more modern Rota-lay block. As each coil is removed sufficient wire is cut out so that all the required tests can be applied, thus giving the answer to two questions — (1) Is the coil now ready for disposal within the specification? (2) Is the coil still running on the plant also within specification? In the case of this type of process where 20 to 40 end plant is normal it cannot be said that tests results from one of the wires will give a true picture of the whole, but if every coil is tested in this fashion a clear picture of the quality of the product and the efficiency of the plant will soon emerge.

* * *

It is not intended to deal with the manufacture of wire products because quality control is by comparison a simple matter to operate in any of these fields.

Statistical Quality Control

We now leave for the time being the whole question of wire manufacture and consider the comparatively simple mathematical techniques that are used in statistical quality control.

* * *

Quality control means that we must establish a normal level and at the same time find out which deviations are abnormal. Where do the figures come from? Are these correct? We take two measurements which give different answers, which is correct? These are the sort of questions we must be able to answer when the figures have been carefully analysed.

* * *

Throughout the period spent on studying quality control it has always been the writer's intention to reduce the arithmetic to a minimum and concentrate on using visual aids.

* * *

There are many text books on this subject, (q.v. bibliography), and consequently it is not intended to devote too much time to the theory of the arithmetical side, but rather to see what can be done quickly, and to no greater accuracy than can be reasonably expected in practice. *(see definitions next page)*

Principles

The two main types of quality control are:

(a) Quantitative data — measurements made on a continuous scale.

(b) Qualitative data — articles classified as defective.

* * *

In dealing with the first — and possibly the main type, in our case — we would briefly cover the main principles:

i) When measurements are made of a number of articles produced under reasonably constant conditions it is found that they tend to cluster around a central value. The measurements will also be grouped and tend to cover the whole range on either side of the central value. From this collection of measurements we get:

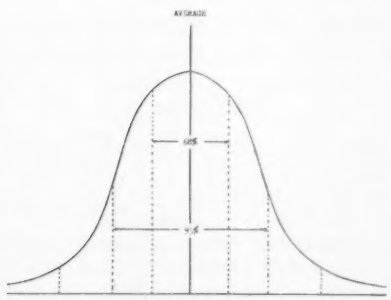
(a) The average.

(b) The measure of spread (for a small number of measurements the spread is usually referred to as "range", whilst the standard deviation is a suitable measurement for a considerable number of measurements).

ii) Exceptions that fall outside the general pattern are usually due to what is known as "assignable causes" and are usually very small in number.

Definitions.

Observation:	**The measurements of quality characteristics observed on any specimen.**
Sample:	**Portion of material taken from a large bulk which is used to give information as to the quality of the larger quantity.**
Random Sample:	**A sample taken at any time in such a way that every individual has an equal chance of being selected.**
Defective:	**Any article, or batch, which fails to comply with the specification for a particular job.**
Rejects:	**This is practically the same as "defective" except whereas the reject is useless the defective can often be used for some other job.**
Average:	**The sum of observations divided by their number.**
Range:	**Distance between extreme observations.**
Standard Deviation:	**The square root of the average of the squares of the deviation of all the observations.**
Distribution Curve:	**(This is sometimes known as a "Frequency Curve"). The curve produced from many observations.**
Normal Distribution Curve:	**This curve is met most frequently in practice and can be defined mathematically. We find that the area bounded by one standard deviation on either side of the average covers 68% of the population, whereas two standard deviations on either side covers 95%. Three standard deviations only increase the percentage to 97.7% and for all practical purposes it is not necessary to consider any further, in fact, as much work as possible should be done within the two standard deviations range. (Fig. 1).**
Assignable Causes:	**Factors that are known to have affected the product and can be identified and possibly remedied.**



NORMAL DISTRIBUTION CURVE

(FIG. 1)

iii) If the same pattern of measurements appears regularly over a period of time the production process can be said to be "in control" or "stable". This does not mean, of course, that the material is necessarily within specification.

iv) Usually the general average can be altered by slight alterations to process or plant, but the standard deviation or minimum variability cannot be altered without drastic changes to the process.

v) It is necessary all the time to produce continuous data which should be charted, showing the full story of what is happening on the plant by means of random sampling. It is important at this stage to realise that the range and variability must be within the specification, otherwise any method of control will still result in throwing up many rejects or defectives.

vi) By sampling at random intervals it is possible to keep the plant under control and at the same time to ensure that the defectives are kept to a minimum.

Practical Operation

For many years the basic method of inspection in the wire trade has been simply to produce the wire in batches, "like we have always done", and then proceed to sort good from bad. To a large extent this system still operates, but slowly quality control is beginning to make itself known.

* * *

As the writer stated earlier in the paper, he has concerned himself particularly with a Galvanising Plant, on one hand with Electrolytic Galvanising, and on the other with the more conventional Hot Dip Galvanising process. Concentration has been on the former as it is a process which lends itself to strict control, and it has been necessary on economic grounds to tackle the problem in a new way.

* * *

Most of the ground work has been done and it is hoped that full control will very soon be in operation.

* * *

The procedure for many years has been to produce the wire on the plants and transfer the finished wire to the warehouse where final inspection and testing takes place prior to despatch.

* * *

The only place for inspection to take place is at the end of the production line and so close in time that we know the state of the material still being produced.

* * *

In other words, controlling the process rather than the product —concentrate on quantitative data, not on qualitative data.

* * *

We must do all possible to prevent making defective wire rather than to find it at a later date with all the problems of deficiencies on particular orders and reallocation of the defect.

* * *

It has already been established that each coil of wire taken from the plant was labelled, showing basic information of the size, quality, and type of galvanised coat. The label was also serial numbered to simplify the testing procedure as it was previously necessary for the tester to serial number his coils and test-ends prior to his actual testing.

* * *

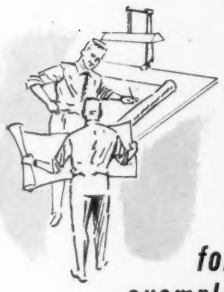
Once the coils were visually inspected and tied up to conform with the customer's coil weight specification, a front and back end was left in each coil for physical testing. As will be seen from this procedure it was purely a question of sorting good from bad, and the delay between production and testing was generally too long, so that the information gleaned from the test results was of little, or no use to the process supervisor.

* * *

He was not altogether kept in the dark as spot checks were made on current production, but is was of no great value because of the very nature of this type of process. Information from, say two wires on a 20-end plant, will not always, if ever, give a true picture.

* * *

It should be pointed out at this juncture that the majority of the wire produced is predominately mild steel, and quality control can be more easily applied to mild steel



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Recommended for wire sizes No. 24 th 40 AWG. Handles 4½″ and 6″ dia. spool dia. arbor, and 8″ to 12″ dia. reels with or 3″ arbor. Maximum traverse 13″.

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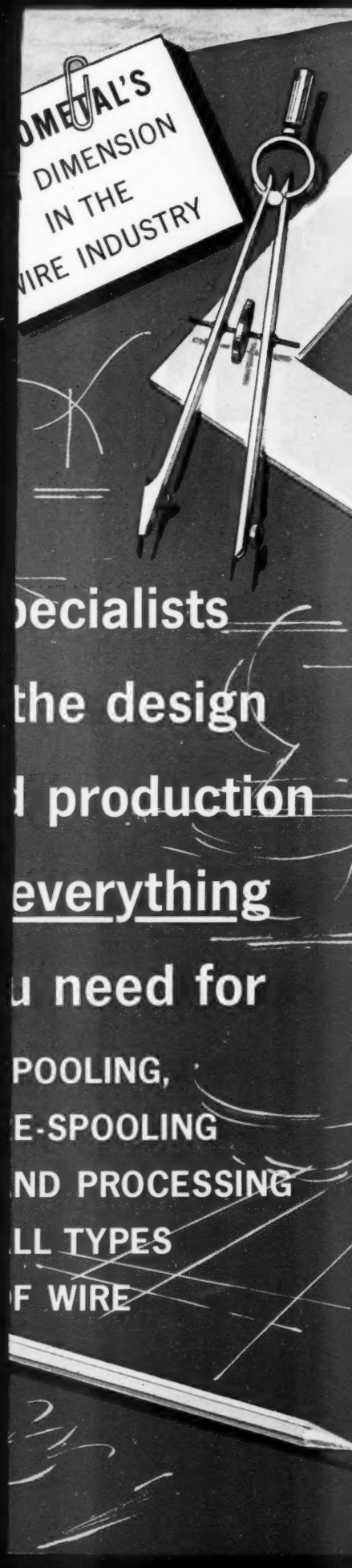
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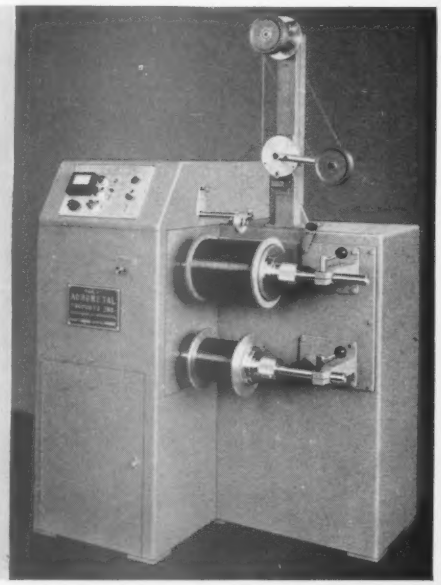

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- a. Aluminum
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  - Cast and Welded
- b. Steel
  - Cast and Welded
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  2. For 14" I.D. Reel-less Package
  3. For 5" Arbor Hole Reels
  4. For sheet metal
- b. Mechanical—Perimeter Type
  1. For 12", 18", 22", 30", 36", 42" Steel Reels

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- a. Universal type—for 16" to 30" reels
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production than to patent steel.

* * *

The patent steel problem has been tackled and fairly strict control has been obtained by using a similar system somewhat enlarged. The new method adopted was to take out a test end every time a coil was removed from a block. The test end was attached to a serial numbered tear-off portion of the label remaining on the coil still running on the plant. This tear-off portion was marked with the number of the block it had been taken from and the ends taken away in batches for testing. Within 15 to 20 minutes the full test results were known and the information passed back immediately to the Plant Foreman, who could make alterations to conditions as necessary.

* * *

This series of tests not only gave the information regarding the coils still in production, but also proved the condition of the back end of the coils just taken from the blocks.

* * *

The tester was then in a position to pass or reject the coils that had been removed from the plant, and he indicated this by clipping the labels with a pair of ticket clippers for "passed" wire, or adding a different type of label for "defectives", detailing the reason for "no pass".

* * *

It will be seen from this method that we have already reduced the amount of testing by 50% and at the same time ensured that the tests take place as near to the process as is possible.

* * *

Like many of the products that are produced at the present time, coils of wire can only be sampled at either, or both ends, and therefore it is necessary to arrange that the coils are produced and tested at irregular intervals.

* * *

A special test book is used for each plant. Each line being numbered 1 to 20 to correspond with the number of ends running on the Plant. The pages of the books are numbered consecutively and, therefore, a series of tests on one sheet refers to the front ends of the coils, whereas the following sheet records the back ends of the same coils. Each test result is applicable to two coils of wire.

* * *

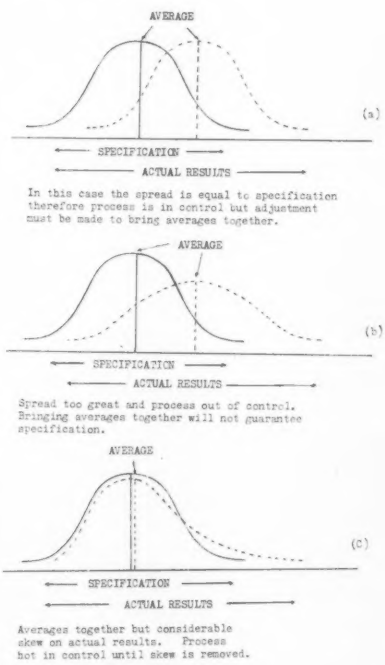
To complete the cycle we must now use the results obtained to arrive at our statistical data for quality control.

* * *

Add the results now obtained and find the average (x), called "x bar", by dividing the total of the sample (x) by the number (n). With this information we now use the simple formula:

$$SD = \sqrt{\frac{\Sigma\left(x - \bar{x}\right)^2}{n-1}}$$

This now gives the standard deviation. It is important to note here that as many results as possible must be taken over a long period to arrive at a reasonably correct figure. (Fig. 2).


AVERAGE
(a)
SPECIFICATION
ACTUAL RESULTS
In this case the spread is equal to specification therefore process is in control but adjustment must be made to bring averages together.
AVERAGE
(b)
SPECIFICATION
ACTUAL RESULTS
Spread too great and process out of control. Bringing averages together will not guarantee specification.
AVERAGE
(c)
SPECIFICATION
ACTUAL RESULTS
Averages together but considerable skew on actual results. Process not in control until skew is removed.
(FIG. 2)

We must now stop at this point and find out what method can be used to present this information quickly and simply so that all concerned can understand it.

* * *

The normal method of doing this is to produce a control chart, made on suitable graph paper, where the information is plotted after each sampling has taken place. To start a Control Chart we must know the standard deviation of the particular measurements that we are concerned with, and it is of no great importance at this stage to attain extreme accuracy. It was pointed out earlier that one of the fundamental points of operating a quality control system was not to work to any greater accuracy on paper than can be achieved practically.

* * *

The main observations we were concerned with was the coat weight, and by using the standard formula we calculated from many previous results the standard deviation. We arrived at the figure of 0.03 ozs/sq. ft. as the standard deviation. It is interesting to note that after some months of practice this finding has proved to be correct for all practical purposes.

* * *

Using this figure of 0.03 ozs/sq. ft. and at the same time applying the principles we dealt with earlier, i.e. using two standard deviations only, we made out a control chart using as the lower control limit the figure laid down in B.S.S. 443. For example:—

On wires requiring 0.9 ozs/sq. ft. minimum the following levels were established:

Lower Control limit	**0.90 ozs/sq. ft.**
Lower Warning limit	**0.93 ozs/sq. ft.**
Nominal or average	**0.96 ozs/sq. ft.**
Upper Warning Limit	**0.99 ozs/sq. ft.**
Upper Control limit	**1.02 ozs/sq. ft.**

Specific instructions were given to the personnel controlling the units to aim at 0.96 ozs/sq. ft. and the inspection staff was told to draw attention to anything which went below 0.93 ozs/sq. ft.

* * *

Although we are only using two standard deviations we find that apart from an occasional fault on a particular end, due to an assignable cause, our calculations have been quite accurate enough to show the general trend. Our standard deviation has obviously only been a "good estimate", but in the early stages one has to make a start somewhere.

* * *

The simple method for doing

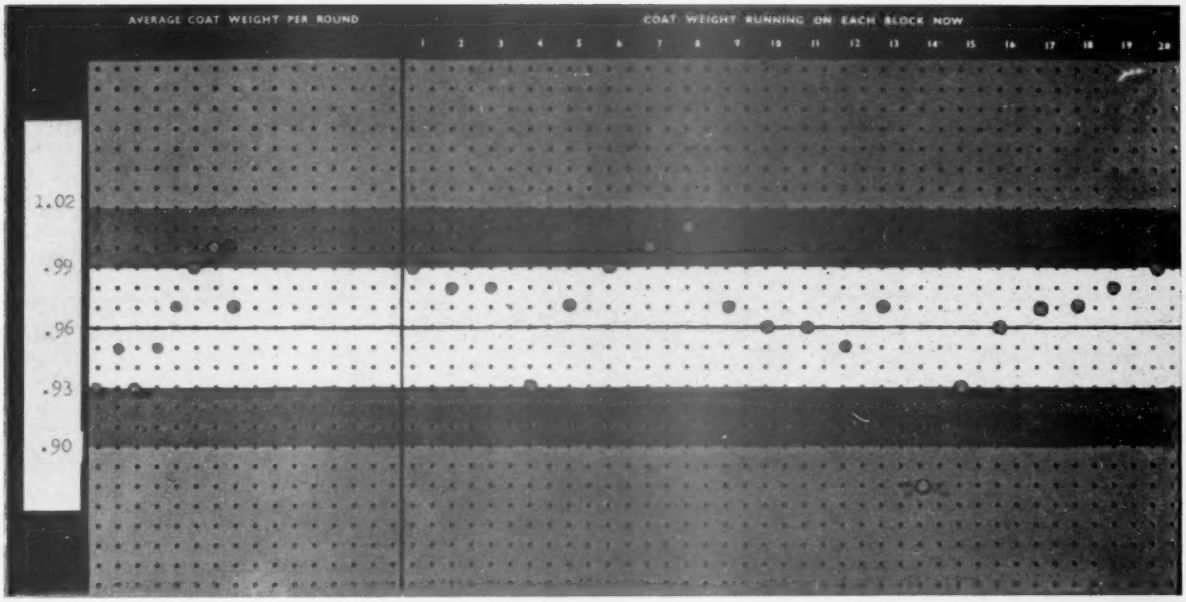


Fig. 3 — Peg Board Control Chart. Results should be kept within the white area, but the warning areas in green allow for the normal spread. Note number 14 is in the red area, low cost weight due to assignable causes.

this was to find the arithmetic mean of all the tests taken in the particular sample and plot this on the graph. This is of no great use unless the range (w) is known as well. Most of the text books suggest that the range be plotted on a separate graph, but we decided to carry this one step further and instead of plotting the range as a single figure (e.g. lowest reading 0.91 ozs/sq. ft — highest reading 0.99 ozs/sq. ft. — therefore the range would be 0.08 ozs.) we decided to plot the actual results taken from each block, the first part of the chart showing the average result ($\bar{x}$) obtained on the last sample taken from each block.

* * *

To create interest and to avoid the business of trying to have paper control charts on view near the plant, use was made of a pegboard. A suitable board was made surrounded by a frame and the various areas painted in different colours. The plotting was then done by using aluminum rivets. (Fig. 3).

* * *

By this method the control chart is durable, effective, easy to operate, and very easy to read. The indices must obviously be changed every time a size change takes place on the plant, and these are made out on hardboard and are interchangeable as required.

To sum up it should now be realized that we have achieved the following points:

(i) Reduced the amount of testing by 50%.

(ii) Fed back the written information on testing to the Production Foreman much earlier.

(iii) Produced an effective control chart to give a "running commentary".

* * *

The other essential physical property requiring control is tensile, and there is no reason why this cannot be done in the same way.

* * *

The whole field of wire production can now be surveyed and it is visualized that quality control can, and will, become an essential part of the whole structure.

Rods

Sampling of bulk supplies will give a clear indication that the base material is within the quality specification.

Wiredrawing

Check continually at the machines to ensure that the wire is consistent and within the Specification required by the Customer or the next process. Make immediate adjustments if it is obvious the product is not under control, or reallocate to an alternative order.

Galvanising, Annealing, Patenting, Etc.

Continue in the same way applying control to all features required by the Specification, and regularly assess the value of information produced.

Netting and Fence Production

As all wire up to this stage is carefully controlled the emphasis on these products is on the length/weight ratios, and regular sampling will give all the information required.

Nails, Cut Lengths, Etc.

Again the emphasis can be diverted from the base wire and applied to packaging and length/weight ratios. Considerable advances have already been made in other industries which are concerned particularly with packaging. Their findings should be of great value to this section of the wire industry which is tending to venture more into the new methods of packaging.

Final Note

The whole problem lends itself

(*Please turn to page* 377)

Construction Details and Processing Methods of Geophysical Cables

by Carroll P. McKenna
Chief Chemist
Vector Manufacturing Company
Houston, Texas

This paper was presented at the Ninth Annual Symposium on Technical Progress in Communication Wires and Cables, held at Asbury Park, N. J., from November 30 through December 2, 1960, under the auspices of the U. S. Army Signal Research & Development Laboratory, Fort Monmouth, N. J.

Our organization provides specially designed and custom built cables for that branch of the petroleum industry which does geophysical prospecting by means of seismic survey operations. One might say that these geophysicists listen in to Mother Nature's heartbeat in their constant search for new oil deposits.

* * *

One of the basic tools of the geophysical industry is the seismic detector or geophone. This is a compact but extremely sensitive pick-up device which receives the direct and reflected signals of an elastic wave generated by a dynamite blast and passes them along as electrical impulses to a special multiple galvanometer recording camera, and/or tape recording equipment.

* * *

The geophones are used in various patterns, arrays or spreads made up of 48 to as many as 1500 detectors and distributed over 15 to 25 acres in area. These spreads are picked up and laid down as often as 15 times a day in surveying open country. To achieve this mobility and speed requires a combination of specially designed components such as power driven take-up reels or a device known as a "cable squirter" and a system for attaching and detaching the numerous geophones to the lead-in cable at contact points known as "takeouts".

* * *

This latter portion of the operation is where we come in, providing the cable and accessories which each customer has evolved as the most practical for his own particular method of exploration.

* * *

As one can readily see from the foregoing thumbnail sketch of the manner in which the equipment is handled, the cables used must be lightweight, flexible and extremely strong and durable. The basic element of construction employed to achieve these qualities is the use of stranded or flexible conductors made of copper-clad steel, beryllium copper, cadmium bronze or phosphor bronze governed by the ultimate end use.

Land Cables

In most of our land survey cables, the basic conductor approximates a size 21 AWG made up of 7/.011—30% conductivity copperweld. This gives us an average breaking strength of 100 pounds per conductor.

* * *

With the signal strength varying in the range of 5 microvolts to 75 millivolts we are able to use thin walls of insulating materials which are not particularly good as dielectric materials are rated. Much of our production is insulated with a 7 mil wall of nylon with the fourteen colors for coding made possible through the use of "Wilson Products" line of color concentrates. This same size basic conductor is also insulated with a 90 durometer vinyl compound for use in the all-plastic cable construction. The nylon insulated conductors are used as twisted pairs, cabled and jacketed with a 60% natural rubber jacket. The choice of construction is determined by the temperature range in the area of operations.

* * *

To get to the matter of making the takeout points on the cable: The groundwork for all this is laid when a customer orders, for example, an 1870 foot length of cable with 50 feet of lead-in on each end and 13 groups of take-out contact points each having 4 takeouts per group wired in series on a 30 foot spacing between takeouts and 50 feet between groups.

* * *

First a working drawing is made to show at a glance the exact spacings and distances involved. An adding machine tape is then run up to give the cumulative footages from one end and the takeout points are indicated with various colored pencil markings.

* * *

The necessary twisted pairs are taken from stock and measured onto 10 inch Clark spools which serve as processing reels in our special type of planetary cablers. The cabling machines are equipped with fast-stop braking mechanisms and three-wheel footage counters which measure down to tenths of a foot. The accurate spacing of these points is necessary because of the great sensitivity of the electronic equipment used with these cables.

* * *

At each of the points set up on the adding machine tape, the operator stops the cabler and proceeds to pull a little slack in the designated pair and pulls this slack through the gathering eye and after separating the two conductors of the pair, makes a figure eight loop in each of them with about 1½ inches of wire and tapes the loops down with the proper coded color of tape.

* * *

This slack loop technique is repeated at each point requiring a

subsequent takeout. It does away with any possible strain being set up when the conductors are later brought out of the cable assembly to be worked into contact points.

* * *

In vinyl cable assemblies, an open serve of fiberglass yarn is applied in each direction to hold the cable together for jacketing. With nylon conductors the assembly is taped with a cotton cloth-backed industrial adhesive tape having a slight over-lap. This provides a locking mechanism to prevent the 60% natural rubber jacket from milking back on the cable squirters and power reels used in the field. The vinyl jacket is rigid enough to overcome this tendency with its normal shrink-fit on the assembly.

* * *

After jacketing, the cable goes through a measuring lay-out operation which is simply a double-check on the takeout spacings, and markers are put over the points to be "operated on". In the cable used as an example, this would amount to 52 takeout terminals which would have to be made on the 1870 foot length.

* * *

The cable is set up at a work bench having a pair of air-operated vises to hold the section in place while being worked on and the operator starts the process of making the takeouts. For most electrical control or communications applications, the cable at this point would be considered as completed, but for use as a geophysical cable it has just begun.

* * *

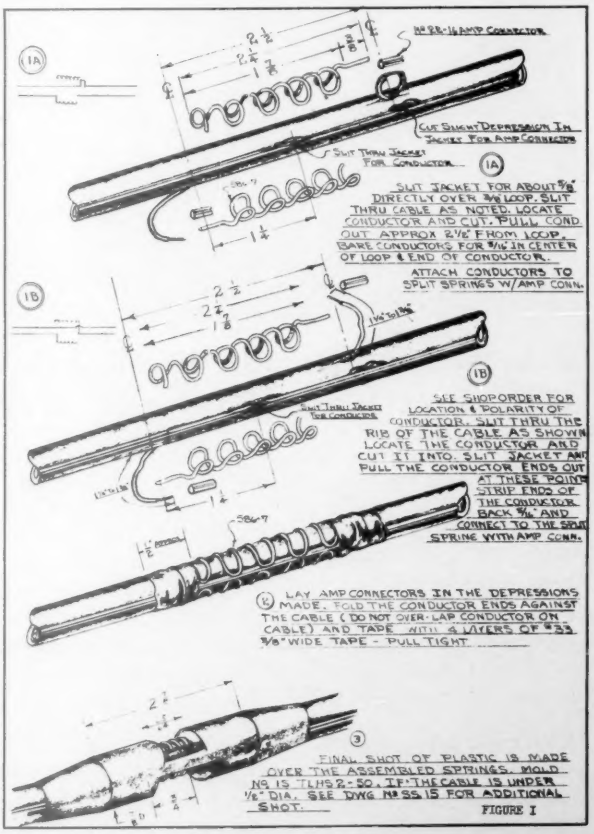
The location of the slack loops can be discerned in the cable jacket and incisions are made to expose the wire at each of these points. Many times, the circuitry of each group will require a combination of series and parallel connections which require continuity of the conductor. This is where the spare wire in the loops comes into play.

* * *

The actual contact points are made of .040" soft Monel wire which is first shaped into a flat zig-zag spring shape and then formed with a central radius to fit the cable, leaving, in the latest design a wing extending along each edge. After the forming of the spring is completed, the Monel wire has reached a point a little better than half-hard due to work-hardening.

* * *

The conductors are attached to the springs in the circuit called for and secured with copper crimp connectors. An insulating strip of rubber is put between the wings on each side of the cable, a fitted shim made of .040" Monel sheet and corrugated to match the contact spring is also positioned under the spring at each contact point and the whole assembly then is laced into position with linen or nylon twine and each end of the unit is bound down with industrial adhesive tape (See Figure 1.)


1A
CUT SLIGHT DEPRESSION IN JACKET FOR AMP CONNECTION
SLIT JACKET FOR ABOUT 3/8" DIRECTLY OVER 3/8" LOOP. SLIT THRU CABLE AS NOTED. LOCATE CONDUCTOR AND CUT. PULL COND OUT APPROX 2 1/2" FROM LOOP. BARE CONDUCTORS FOR 5/16" IN CENTER OF LOOP & END OF CONDUCTOR.
ATTACH CONDUCTORS TO SPLIT SPRINGS W/ AMP CONN.
1B
SEE SHOPORDER FOR LOCATION & POLARITY OF CONDUCTOR. SLIT THRU THE RIB OF THE CABLE AS SHOWN LOCATE THE CONDUCTOR AND CUT IT INTO. SLIT JACKET AND PULL THE CONDUCTOR ENDS OUT
AT THESE POINTS STRIP ENDS OF THE CONDUCTOR BACK 3/8" AND CONNECT TO THE SPLIT SPRING WITH AMP CONN.
2
LAY AMP CONNECTORS IN THE DEPRESSIONS MADE. FOLD THE CONDUCTOR ENDS AGAINST THE CABLE (DO NOT OVER-LAP CONDUCTOR ON CABLE) AND TAPE WITH 4 LAYERS OF #33 3/8" WIDE TAPE - PULL TIGHT
3
FINAL SHOT OF PLASTIC IS MADE OVER THE ASSEMBLED SPRINGS. MOLD NO. IS TLHS 2-50. IF THE CABLE IS UNDER 1/2" DIA. SEE DWG NO. 55 IS FOR ADDITIONAL SHOT.
FIGURE I

When all of the 52 takeouts of our hypothetical cable have been built, the cable goes to the molding department where colored natural rubber is molded over each takeout to establish its polarity by the shape of the contact openings and its group in the sequence of groups by the color code used in molding.

* * *

The openings allow contact to be made only in the proper manner as shown when the geophone is attached with a connecting clip of special design. (See Figure II).

FIGURE II

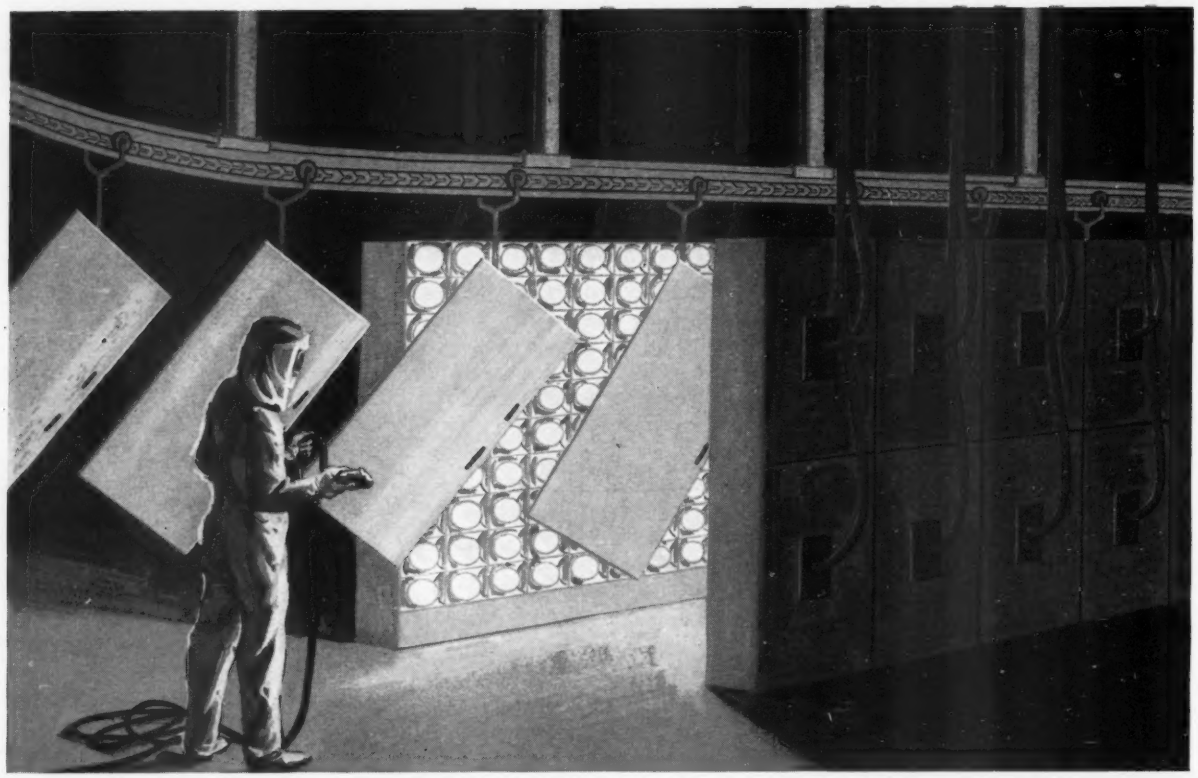
This clip has two jaws of different widths which prevent reversal of polarity in attaching the phone to the cable. The cable is terminated with a multiple pin male and female connector on either end as specified by the customer. (See Figures III & IV.)

* * *

In further carrying out the combination of flexibility and strength needed through-out a geophysical survey cable system, the leader wire used on the geophone-to-clip unit is made up of 40% conductivity Copperweld in 1/32", 3/64" and 1/16" sizes as 7/3/.005, 7/6/.005 and 7/7/.0071. These rugged conductors are used in two conductor and three conductor leaders which

SILICONE NEWS from Dow Corning

Use This Cable Plant-Wide



Silastic Insulation Withstands the Rigors of Heat, Cold and Weathering

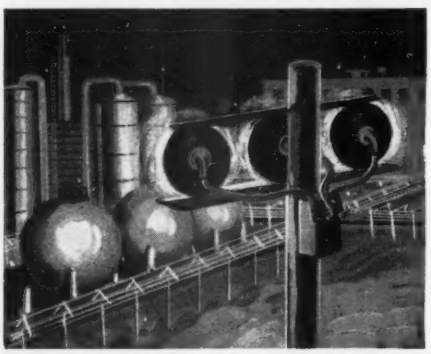
You can eliminate the extra expense of stocking many specialty wires and cables. How? By specifying Silastic®, the Dow Corning silicone rubber.

Silastic is more than a match for many of your plant's toughest service conditions. First of all, you can count on Silastic to give reliable service in or near ovens, boilers, fans, blowers and other "hot" applications where temperatures go up to 260 C. This cable covering resists the torture of high temperature aging, overloads or sudden power surges. Stays rubbery . . . it won't crack to allow electrical failure. And there's no brittleness even at —90 C . . . so you can flex Silastic insulated cable in bitter cold, too.

What's more, this versatile wire and cable insulation resists year 'round outdoor weathering . . . won't harden, crack or check. At a south Florida test station, Silastic samples showed no signs of weather deterioration after more than 9 years of continuous exposure.

Leading manufacturers now offer power cable, control cable, hookup wire, fixture wire and building wire with insulation of Silastic.

TYPICAL PROPERTIES OF SILASTIC FOR WIRE	
Temperature range, °F	—130 to 500
Insulation resistance, megohms/1000 ft.	1000 to 3000
Electric strength, volts/mil	300 to 500
Dielectric constant, 10^2 cycles per second, nominal	3.2



For new booklet on how to save with Silastic insulated wire and cable and list of suppliers, please address Dept. 8815

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Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Cable Manufacturers

A series of easy-to-use Silastic® compounds especially formulated for use as wire insulation is available from Dow Corning. These compounds provide the performance discussed in the adjoining advertisement, qualify for UL approved constructions, and meet Air Force and Navy cable specifications.

Easily processed on standard equipment, Silastic compounds require only a minimum of milling — and some can be fed directly to extruder from package. Silastic insulated wire is vulcanized by CV or by hot air, forming dense homogeneous dielectric walls for constructions ranging from hook-up wire to power cable. Braids and serves can be applied without further cure.

For FULL INFORMATION and TECHNICAL ASSISTANCE, contact your nearest Dow Corning branch office or write Dept. 8815.

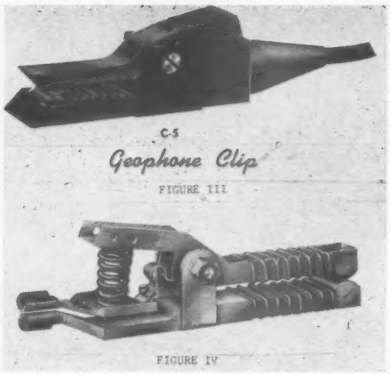


FIGURE III

FIGURE IV

also serve as convenient handles for retrieving and carrying the geophones attached to them.

* * *

Figure V shows another variation of a takeout point which uses a solid band of Monel as the contact surface.

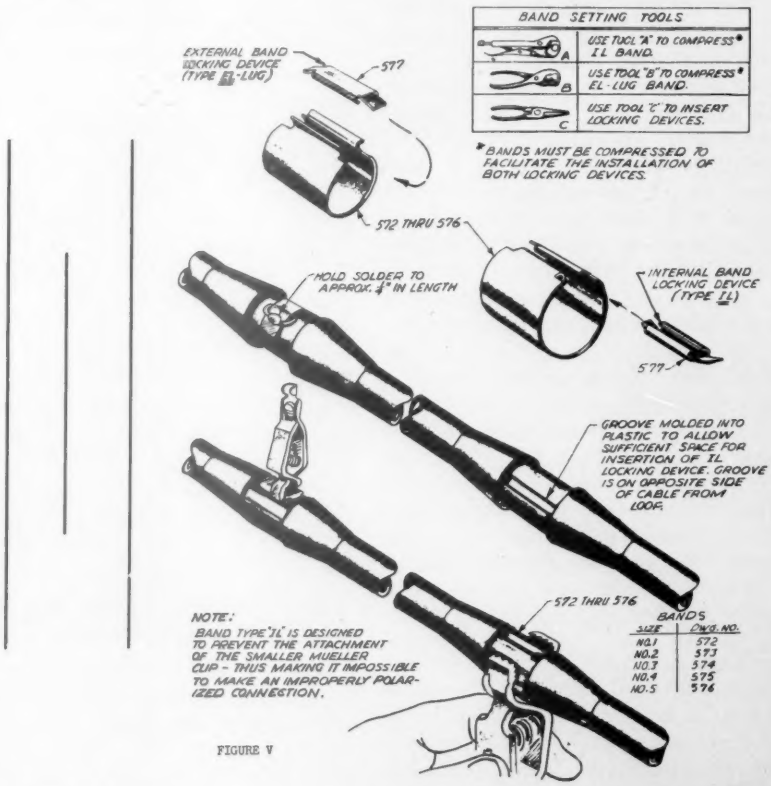

BAND SETTING TOOLS
USE TOOL "A" TO COMPRESS* IL BAND.
USE TOOL "B" TO COMPRESS* EL-LUG BAND.
USE TOOL "C" TO INSERT LOCKING DEVICES.
*BANDS MUST BE COMPRESSED TO FACILITATE THE INSTALLATION OF BOTH LOCKING DEVICES.
EXTERNAL BAND LOCKING DEVICE (TYPE EL-LUG)
577
572 THRU 576
HOLD SOLDER TO APPROX. ¼" IN LENGTH
INTERNAL BAND LOCKING DEVICE (TYPE IL)
577
GROOVE MOLDED INTO PLASTIC TO ALLOW SUFFICIENT SPACE FOR INSERTION OF IL LOCKING DEVICE. GROOVE IS ON OPPOSITE SIDE OF CABLE FROM LOOP.
572 THRU 576
NOTE: BAND TYPE "IL" IS DESIGNED TO PREVENT THE ATTACHMENT OF THE SMALLER MUELLER CLIP - THUS MAKING IT IMPOSSIBLE TO MAKE AN IMPROPERLY POLARIZED CONNECTION.
BANDS
SIZE | DWG. NO.
NO.1 | 572
NO.2 | 573
NO.3 | 574
NO.4 | 575
NO.5 | 576

FIGURE V

diameter would be difficult to move from shot to shot.

* * *

To facilitate such an operation, we have evolved a type of cable based on #28 AWG hard drawn cadmium bronze of 85% conductivity. This conductor is the only solid conductor used in our entire line of geophysical production. The primary insulation is a urethane enamel over which we extrude a secondary of 4 mils of Type 101 "Zytel" nylon to provide a means of color coding the twisted pairs as well as affording additional protection to the primary insulation.

* * *

A 13 pair magnet wire construction with rubber jacket similar to the previous example would weigh only 20 pounds per thousand feet by comparison and be only .179" in diameter. In spite of its compact size and flexibility, the breaking strength of such a piece of cable averages 250 pounds.

* * *

The takeout principle for this smaller assembly is almost the same as for the regular land cable except for the use of wire wrapped

Tiny Portable Cables

Although the general type of cable discussed to this point must be classified as portable cable, there are survey locations which are not accessible by truck and must be covered on foot. Under these circumstances, the typical 13 pair cable at 130 pounds per thousand feet in weight and .485" in

terminal points as shown in Figure VI. One feature being that the takeout construction is designed to accommodate the same C-5 Clip for attaching the geophones to the cable.

* * *

This type of cable is generally carried on a lightweight breast reel which will handle up to 2000 feet of cable with takeouts.

Velocity Cables

As mentioned in the opening remarks, in conducting seismic surveys geophysicists measure the transit time of acoustic waves from a dynamite blast down to various rock strata and back up to geophones placed on or near the surface.

* * *

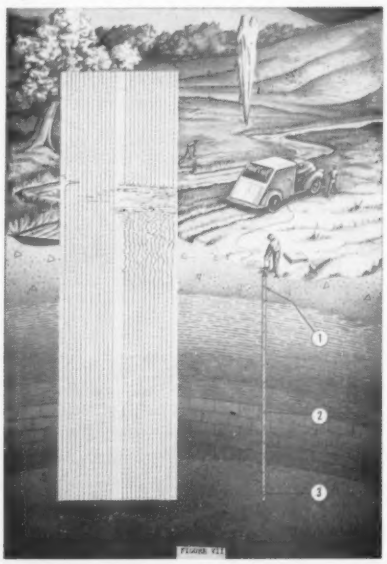
One of the calculations necessary in computing this information is a correction for the abnormally slow travel of the returning waves through the near surface layers of the earth. To obtain the surface velocity correction factor, it has been found advantageous to suspend in a shot hole or core hole, a number of acoustic pressure sensitive detectors spaced at suitable intervals along a multiconductor cable. A small explosive charge at or very near the surface is then detonated which generates acoustic waves which travel downward and outward. These waves arrive first at the shallowest detector, then the next and so on down to the deepest detector in the fluid filled hole, causing signals to be generated in each detector in its turn at the instant the acoustic wave arrives.

* * *

Each detector's electrical output is fed upward through the cable along a separate twisted pair to the seismic recording instruments on the surface. These precision electronic instruments accurately measure and record the wave transit time from the shot to each detector, yielding the information necessary for computation of the velocity of sound in the earth to a number of depths.

* * *

Twelve, sixteen or more detectors are commonly employed on one cable to obtain this information so a corresponding number of velocity determinations are provided for each shot. Depending on detector spacing and hole depth, ranging from 200 to 2000 feet as required, a complete survey of the hole may be accomplished in one, two or three shots with the cable being moved after each shot. (See Figure VII.)



One of the foremost requirements of a cable in velocity measurements of this kind is that the cable must not allow the acoustic wave to travel downward along the cable except at a lower velocity than the same waves will travel through the earth. By using special materials and construction the cable's sound propagation velocity is held below 3500 ft./sec. in the cables having a 1/16″ stress core and below 4000 ft./sec. in the cables made with a 3/32″ stress core. By using preformed galvanized aircraft cable of a 6 x 7 construction with a nylon center and then extruding two concentric layers of vinyl compound of two different durometer hardnesses we achieve a core construction with the minimum velocity propagation.

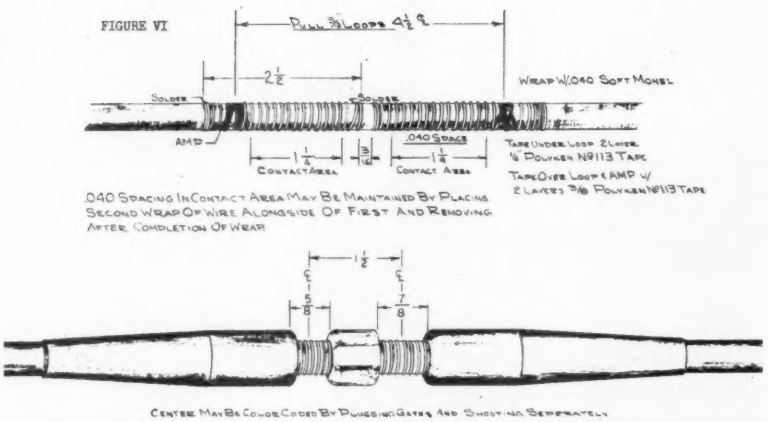


FIGURE VI
Wrap W/.040 Soft Monel
Solder
Solder
AMP
.040 Spacing
Tape Under Loop 2 Layers ½ Polyken #113 Tape
Tape Over Loop & AMP w/ 2 Layers ½ Polyken #113 Tape
Contact Area
Contact Area
.040 Spacing In Contact Area May Be Maintained By Placing Second Wrap Of Wire Alongside Of First And Removing After Completion Of Wrap
Center May Be Color Coded By Plugging Gates And Shooting Separately

The first pass is a 90 Shore A stock and the outer pass is a 75 durometer compound. The finished diameter of the core varies with the size of the stress member and the number of pairs of conductors to be used. A gapped layer of tape is applied to provide an imbedding medium to prevent slippage of the conductors in subsequent handling because this, too, is a portable cable.

* * *

The conductors used are 24 AWG 7/.008 soft copper, one of the few instances where a soft copper conductor is used in our geophysical line. The vinyl insulated conductors are used as twisted pairs and cabled around the taped core with a fairly short lay. The whole assembly is bound with a two-way fiber-glass serve and a tubed jacket of vinyl having good low-temperature flexibility is applied. To give you some indication of the size of the cables alone, those having 12 pairs have an O.D. of .680″ and those of 16 to 20 pairs have an O.D. of .870″.

* * *

After jacketing, the cable goes through the precision counters at the layout bench and is flagged to indicate the locations where the detectors are to be mounted.

* * *

In this case, the detectors are barium titanate piezo-electric cyl-

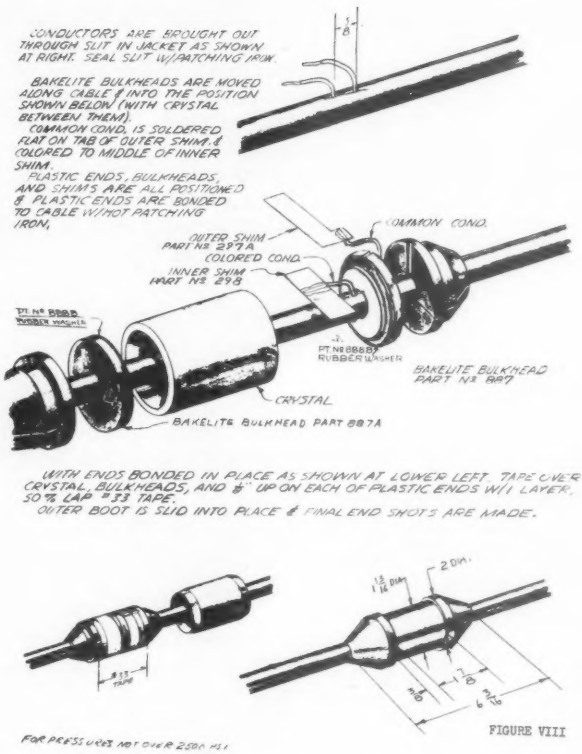

CONDUCTORS ARE BROUGHT OUT THROUGH SLIT IN JACKET AS SHOWN AT RIGHT. SEAL SLIT W/PATCHING IRON.
BAKELITE BULKHEADS ARE MOVED ALONG CABLE & INTO THE POSITION SHOWN BELOW (WITH CRYSTAL BETWEEN THEM).
COMMON COND. IS SOLDERED FLAT ON TAB OF OUTER SHIM & COLORED TO MIDDLE OF INNER SHIM.
PLASTIC ENDS, BULKHEADS, AND SHIMS ARE ALL POSITIONED & PLASTIC ENDS ARE BONDED TO CABLE W/HOT PATCHING IRON.
COMMON COND.
OUTER SHIM PART NO. 297 A
COLORED COND.
INNER SHIM PART NO. 298
PT. NO. 888B RUBBER WASHER
PT. NO. 888B RUBBER WASHER
BAKELITE BULKHEAD PART NO. 887
CRYSTAL
BAKELITE BULKHEAD PART 887A
WITH ENDS BONDED IN PLACE AS SHOWN AT LOWER LEFT. TAPE OVER CRYSTAL, BULKHEADS, AND ⅜" UP ON EACH OF PLASTIC ENDS W/1 LAYER. 50% LAP #33 TAPE.
OUTER BOOT IS SLID INTO PLACE & FINAL END SHOTS ARE MADE.
2 DIA.
FOR PRESSURES NOT OVER 2500 PSI

FIGURE VIII

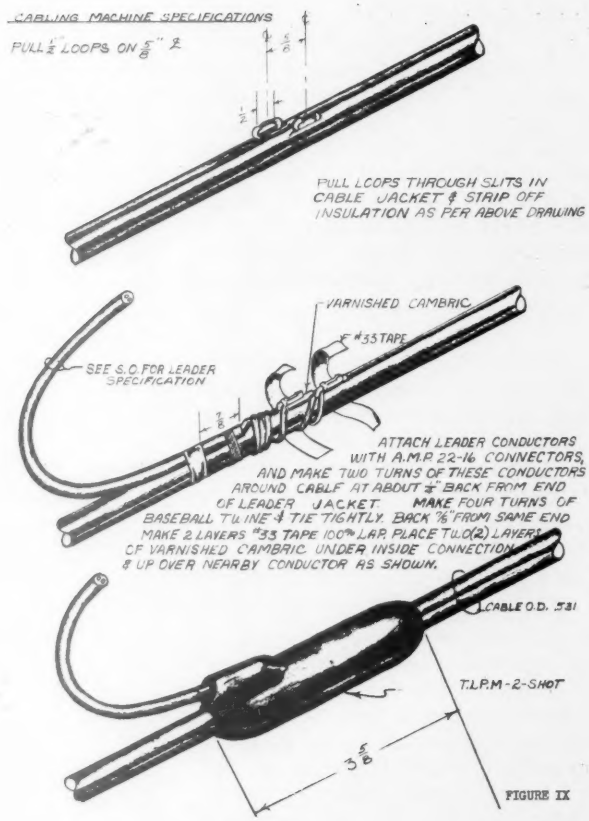

CABLING MACHINE SPECIFICATIONS
PULL ½ LOOPS ON 5/8" Ø
PULL LOOPS THROUGH SLITS IN CABLE JACKET & STRIP OFF INSULATION AS PER ABOVE DRAWING
VARNISHED CAMBRIC
#33 TAPE
SEE S.O. FOR LEADER SPECIFICATION
ATTACH LEADER CONDUCTORS WITH A.M.P. 22-16 CONNECTORS, AND MAKE TWO TURNS OF THESE CONDUCTORS AROUND CABLE AT ABOUT ½" BACK FROM END OF LEADER JACKET. MAKE FOUR TURNS OF BASEBALL TWINE & TIE TIGHTLY. BACK ⅜" FROM SAME END MAKE 2 LAYERS #33 TAPE 100% LAP. PLACE T.L.O. (2) LAYERS OF VARNISHED CAMBRIC UNDER INSIDE CONNECTION & UP OVER NEARBY CONDUCTOR AS SHOWN.
CABLE O.D. .531
T.L.P.M.-2-SHOT
3 5/8"

FIGURE IX

inders which are slid onto the cable and moved individually into position where contact is made with the outer and inner surfaces of the cylinder and the conductors assigned to that position. For work at depths greater than 750 feet, we recommend the use of four such detectors at one foot intervals and wired in parallel at each point to increase the sensitivity while under such great fluid pressure.

* * *

After installation, the crystals are held concentric with shouldered tapers of plastic, a plastic sleeve is slid over the assembly and the whole unit is molded into a streamlined, watertight enlargement of the cable. The greatest O.D. of a detector assembly is 2-1/8" and the diameter of the concentrically mounted matching transformer sometimes used in special applications is only 2-3/8". (See Figure VIII.)

* * *

The bottom end of such a cable is terminated and sealed in a brass fitting used for attaching weights to pull the cable down in fluid filled holes. In addition, the depth is indicated by hot stamped markers along the entire length. Incidentally, this type of cable is not handled on reels for obvious reasons.

Marine Floating Cables

For many years the method used in offshore geophysical exploration employed a "drag cable" technique which had a multiconductor cable assembled around a stress member and the whole thing encased in a protective cover such as a high pressure air hose. Gimbal-mounted geophones were contained in special bronze, cylindrical cases which actually served to join a series of short cable lengths with detectors between them. Each case had a bulky protective rubber boot secured in place over it.

* * *

This cumbersome affair was laid out on the bottom of the gulf or bay area being surveyed and had to be moved after each shot. Moving meant simply dragging the unit to the next location and in many cases this included dragging over coral, oyster shells and other such abrasive formations. An occasional encounter with the ship's propeller also left its mark on such cables.

* * *

In 1955 after a year of intensive development work and field testing, Vector offered a floating cable assembly to the offshore geophysical industry and within six months the pattern of operations had changed over to this new technique. By taking advantage of the exceptional structural strength and low density of expandable polyethylene, a strong self-supporting cable was developed which was capable of being towed and operated on the sea surface. This enabled seismic survey crews to cover 50 to 60 miles of line a day.

* * *

The general construction of floating cables is based on either a 5/16" or 3/8" stainless steel wire rope in combination with one or two jacketed cable units with up to 26 pairs in each.

* * *

The conductors for marine cables are the same size, 21 AWG 7/.011 copperclad steel with 7 mil nylon insulation, as used in our land cables. The twisted pairs are cabled and the assembly taped and

jacketed but in this type of cable neoprene is the jacketing material. The reason for not using a rubber jacket in this construction is that in the past, all floating assemblies have had the cable unit pumped full of light mineral oil just prior to delivery. This was to minimize the effect of water entry into a damaged area of the cable, nylon insulation being particularly susceptible to moisture.

* * *

With the development of a cable filler material based on depolymerized rubber we have replaced the mineral oil and now offer void-free constructions with a soft, flexible, vulcanized filler. This will allow more freedom in the choice of materials used in floating cables in the future.

* * *

In order to maintain uniformity of expansion in the extrusion of the expandable polyethylene, the stress member is first built up to the same diameter as the jacketed cable unit by extrusion with conventional polyethylene. The two or three members, as the case may be, are then extruded in a parallel assembly to a precalculated size configuration which is checked by an actual buoyancy measurement of a one foot section of the warm-up length.

* * *

Where there are three elements in an assembly, the stress member is placed in the center of the more or less flat parallel extrusion. In all cases, the elements contained are not in contact with one another but are separated by the cellular material. At the points flagged with colored tape to designate them as the location of detectors, the expandable polyethylene is manually scraped from the cable side of the extrusion as it leaves the crosshead. This leaves two or three feet of the cable exposed for subsequent application of a pigtail type of takeout.

* * *

To support the weight of the magnetostriction transducers used as seismic detectors on marine cables, the design flotation of the cable may be set up in the vicinity of one ounce positive buoyancy per foot of cable assembly.

The attachment of detectors to a marine cable varies from a land cable in that at each takeout point where the conductors are brought out through the cable, an 18″ to 24″ length of two conductor leader is connected to the slack loops in the desired pair.

* * *

A minimum of two wraps are made with the leader conductors around the cable as strain relief before the whole junction is encased in transfer molded neoprene to form a watertight assembly. (See Figure IX.)

* * *

The end of each pigtail is equipped with the female half of a specially designed watertight connector developed for offshore use. The transducers, which are fitted with the male end and a short section of leader, are simply plugged in and then taped to the floating cable assembly. (See Figure X.)

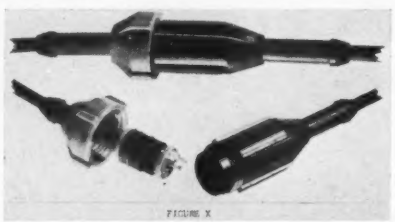


FIGURE X

In operation, each detector should ideally be at a position 10 to 15 feet below the surface to minimize the disturbance created by wave action. To achieve this, each detector location is spanned by about 30 feet of aircraft type elastic shock cord which bears 4 plastic floats and is attached to the cable at points about 25% greater than its normal length. In towing, the shock cord elongates and allows the cable assembly to straighten out and while at rest for a shot, the retraction of the cord allows the detectors to sink to operating depth. (See Figure XI.)

Processing Methods

Two principal factors govern the design of equipment used in our operation, limited space and specialized operation. One type of machine in the latter category is that used in our planetary cabling operation. As mentioned earlier in this paper, in making takeouts the operator must be able to stop the cabling machine with speed and accuracy. To facilitate this, our planetary cablers are built around a lightweight head made up of two 5/8″ sheets of plywood joined to make a 1-1/4″ thick core which is faced on each side with 1/8″ aluminum sheet. The gimbals are cast of aluminum alloy and are designed to carry standard ten inch Clarke spools. The planetary system is controlled by an endless chain and sprocket drive while a fast-acting air-brake serves to stop the unit as required for pulling takeout loops in the cable assembly.

* * *

Our twisting machines operate on the same basic principle as any other but are designed in such a

(*Please turn to page* 377)

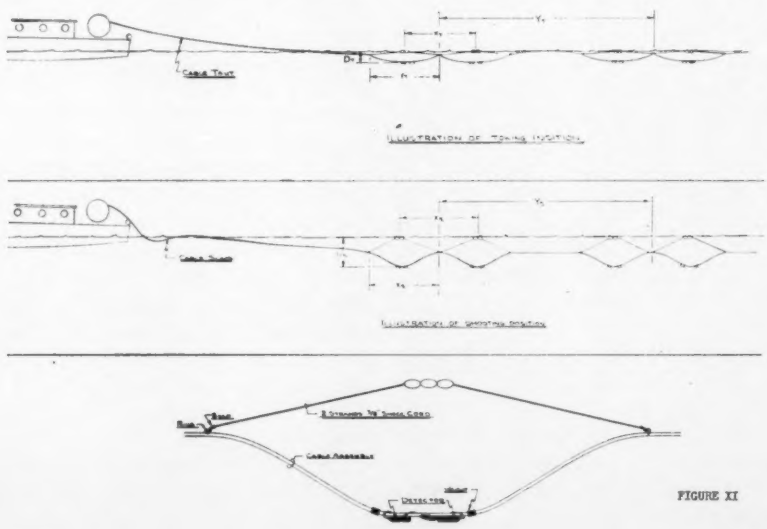


FIGURE XI

SAVE WITH ELGIN'S 4-POINT DIAMOND COMPOUND PROGRAM

HERE'S HOW

Maintain top die performance and production economy with this complete Elgin program that includes a fully rounded service for all your diamond abrasive needs.

1

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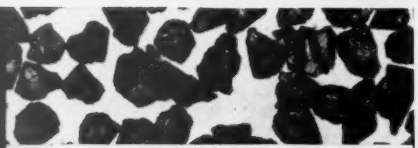

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The Decarburization of Steel Wire

by Dr. Peter Fischer

Summary

The influence of the rim-decarburization on the machining and non-machining subsequent treatment as well as on the distortion due to hardening is discussed. The influence on the hardness, the elastic properties, and the fatigue bending behavior is explained on the basis of test results on unalloyed oil-finish heat-treated spring wire. Following the description of the possibilities of recognizing decarburization, is a discussion of its causes, and of the methods of manufacturing wire free from this defect.

* * *

The undesirable appearance of the skin decarburization earlier designated as "soft skin", or "iron skin", has long been known, but up to the present even in highest quality wire it has not always been eliminated. It consists in a more or less strong and deep impoverishment of carbon in the skin layer of the material. Its appearance is manifold: it can embrace the whole surface or occur only in places in the form of streaks or patches, partly also in connection with overrolling or slag occlusion in the surface.

* * *

The decarburized surface has, among other disadvantages, a surface that is softer and less wear resistant. By abrasive stress slight bubbles may form. Decarburized cutting edges in tools are quickly blunted. The bending and deformation behavior is variable. In machining operations the soft layer can easily give rise to smears. The hardening delay is greater. Elastic limit and fatigue resistance diminish.

* * *

On these grounds, in recent years special attention has been directed toward decarburization and its avoidance. The work here reported is concerned with the undesirable appearances occasioned by the decarburization and to the avoidance of decarburized layers, and describes some research results on unalloyed oil-finish heat-treated spring wire.

This article, which appeared in the February, 1960, issue of Draht-Welt, was translated for us by Jerome W. Howe of Worcester, Massachusetts.

Influences on the Non-Cutting And Machining Processes

In wire drawing itself a decarburized layer makes itself most noticeable when it is quite strongly marked and its depth is no longer small relative to the wire diameter. If the drawn wire represents the end product, then the fault exists therefore only in the product, since it presents no difficulty in a manufacturing process. But if the wire is to be further processed, then the decarburization can cause important troubles, especially if a part has to be finished to precise requirements, as is the case with special springs, among other products. By pressing processes, for example, with very pronounced decarburization the prescribed measurement tolerance can only be kept by presses which for the attainment of special rigidity must be considerably over-dimensioned. In curving on specific forms, weaker decarburization makes itself plainly noticeable, for the resilience is no longer as strong as with sound material. With stronger deformation, there appears on decarburized surfaces, which are left free by the manufacturing process, a considerable roughness, similar to the skin of an orange. This can be so pronounced that a simple regular polishing process does not remove it. Except for the orange skin the fault described would not be troublesome in itself, if always an equally strong and equally deep decarburization should exist, which can be allowed for through corresponding machine adjustment. This is however practically never done in practice. Depth and strength of decarburization fluctuate always very greatly within a wire coil.

* * *

If a part manufactured without machining from wire must be milled, then the strength must mostly be so chosen that the milling can be as good as possible. If however the wire is decarburized, then in such places the strength for the milling is insufficient, the material smears, leads to greater cutter wear, and the milled surface is smudgy. This is the case only while milling through the decarburized part and until machining of the sound material resumes. In abrading, the decarburization is only rarely noticeable through an earlier loading of the grinding wheel.

Influences on the Hardening Delay

A low carbon or carbon-free layer, in the course of heating up to tempering temperature, takes part in the conversion only in part or not at all. Correspondingly its spatial extension remains greater than that experienced by the conversion of the carbon-retaining core. Since the material is very soft at the high temperature, it cannot endure the internal stresses thus caused and gives way. Since the decarburized layer is mostly thinner than the sound core, it gives way more and becomes shorter. In the quenching the decarburized layer again takes no or little part in the conversion. It remains therefore, in spatial extension, back behind that of the core which is becoming larger by the martensite conversion. Since the core, in the moment of martensite forming conversion, is soft, it takes place at this time somewhat also, plastically, with the weaker decarburized layer. And internal stresses continue to exist. If the decarburization is equal in all directions, which is rare, then after the tempering the piece will be

shorter than one without decarburization. If the decarburization is non-uniform or only one-sided, then the piece will become curved: the concave side is the area of greatest decarburization. To give a conception of the order of magnitude of this influence, several examples are given with statistics:

A section of wire 4 inches long and with 0.04 in. diameter with all-round uniform decarburization 0.02 mm deep was after hardening about 0.1 mm (0.004 in.) shorter than a non-decarburized piece. A section of wire 1-1/2 in. long and of 0.016 in. diameter with a weak decarburization of only 0.01 mm depth is, after hardening, about 0.03 to 0.05 mm shorter than an unobjectionable piece. A flat wire section 0.028 in. thick, decarburized on one side to a depth of 0.03 mm, has after hardening a curve with about a 4 in. radius. All three specimens were with about 0.80% C.

Influence on the Mechanical Properties

With heat-treated parts, the low surface hardness appears in the first place, especially of course if measured with small test weights. With additional test weight the measured hardness increases, because the hard core material gains more and more in influence. By the Vickers test, it happens however that even with greater pressure the edges of the impression no longer appear distinct but are somewhat indefinite and mostly cylindrically hollowed out.

* * *

Both of a series of hardness tests (described and illustrated in the original article) show how decarburization affects the surface hardness. It is conversely always conceivable that the depth and degree of decarburization can be accurately determined by hardness measurement with different loadings, similarly as by the known process for determining the depth of casing with recarburized layers as well as the thickness of galvanized coatings. In this connection the case represented by Figures 1 and 2 is worthy of mention: here it was attempted to re-carburize a strongly decarburized surface by annealing and subsequent hardening in a buffer gas with high carbon level. The annealing time was however too short, so that between the core with 0.70%C and the re-carburized surface layer, a zone remained with quite low carbon content. This is also expressed by the hardness testing with increasing loadings. The hardness falls at first with increasing loading in order then to rise again.

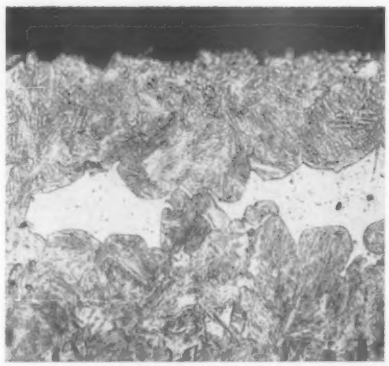

Fig. 1 — Segment of a micro-section from flat-pressed test specimen out of unalloyed steel wire with 0.70% C after hardening. 500 X magnification. The wire was decarburized and was only partly again re-carburized, so that between outer layer and core a soft ferritic zone remained.

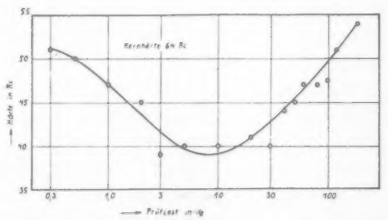

Fig. 2 — Surface hardness of the flat-pressed wire of Fig. 1 after the hardening, in dependence on the test loading.
Kernharte 64 = core hardness 64
Harte = hardness
Pruflast = test loading in kg.

* * *

Next to the hardness, especially for springs, the elastic properties determined by bending tests as well as the flexural fatigue strength are of interest. For the influence of the decarburization on flexural fatigue behavior, tests on patented drawn wire are known. **C. R. Austin** as well as **E. T. Gill** and **R. Goodacre** reported that as a consequence of decarburization the flexural fatigue strength of patented drawn wire can diminish about 15 to 20%. **E. Houdremont** and **H. Bennek** describe tests on decarburized silicon spring steel and discovered that likewise a pronounced reduction of flexural fatigue strength results from the decarburization.

* * *

In order to investigate also the influence of decarburization in the case of unalloyed oil-finish heat-treated wire, for this research an unalloyed steel wire with 1.06%C was chosen. The diameter was 0.02 in., the initial structure nodular finely divided cementite. Specimens were pressed flat to 0.012 in. and then hardened under buffer gas 10 minutes at 1450°F and quenched in oil of 140°F. The buffer gas was Monogas I with 13% CO and 18% H_2. In order to cause a decarburization of the specimen the dew point was by addition of steam to the buffer gas varied between 20°F and 69°F in the hardening furnace. The graded decarburization so achieved was not wholly uniform. Even before the decarburizing hardening, a weak partial decarburization about 0.02 mm deep existed, for even in the undecarburized specimen hardened with a dew point of 20°F the undissolved

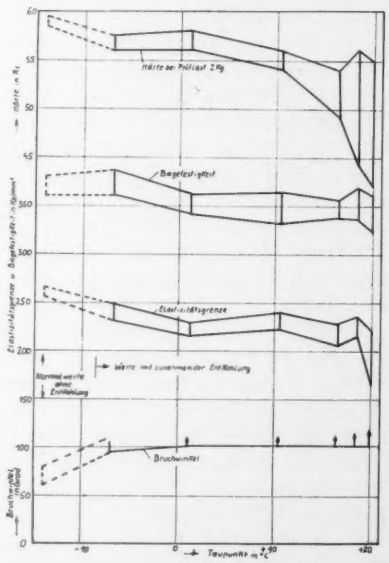

Fig. 3 — Surface hardness and results of the static bending tests for flat-pressed specimens of unalloyed steel wire with 1.06 % C.
Harte bei Pruflast 2 kg = hardness by test load 2 kg.
Harte in Rc = hardness
Biegefestigkeit = bending strength
Biegefestigkeit in kg/mm² = bending strength in kg/mm²
Elasticitatsgrenze = elastic limit
Elasticitatsgrenze u Biegefestigkeit = elastic limit and bending strength in kg/mm²
Werte mit zunehmender Entkohlung = values with increasing decarburization
Normal Werte ohne Entkohlung = normal values without decarburization
Bruchwinkel = breaking angle in Grad = in degrees
Taupunkt in °C = dew point in °C

carbide in the outer layer is much rarer than in the core. In the accompanying Fig. 3 are assembled the results of these tests of surface hardness and static bending tests. In the lack, for comparison, of corresponding values for the undecarburized specimen, values are plotted (by dotted line) from tests of a similar coil with 1.12%C. All specimens were after the heat-treatment polished by the drum process. The surface roughness measured 0.4 to 0.5μ. As the result of the fatigue bending research is not quite clear, because of an inadequate number of tests, repetition of this will be made and then the results will be separately published.

* * *

For the static bending test an inclination pendulum (described by W. Neuhaus in DRAHT 5-1954) was used. For this test the specimen is clamped on one side and then turned about an axis passing through the clamp. In this way it drives a pin attached to an inclination pendulum so that simultaneously the bending angle and the prevailing bending moment can be read. The length of clamp from the point of clamping to the pin on the inclination pendulum bringing on the loading is one-half inch. As elastic limit, somewhat arbitrarily the value for one degree of residual bending was established. As bending strength the value at breaking, or if no break occurred, the value for a total bending of over 100° was used. Elastic limit as well as bending strength were computed as quotient out of the bending moment and the resisting moment of the cross-section against bending. That gives the correct value for the stress in the surface only within the elastic range, while in the plastic range the true values are less than the computed. The quantities shown should therefore be taken only as comparative. From Fig. 3 it is clear that even the weak partial decarburization of 0.02 mm depth results in a noticeable reduction of the elastic limit and that with added degree of decarburization the reduction, in spite of only slightly greater depth of decarburization, can amount to over 20%. The strong spread in the curve in Fig. 3 can be traced to inequalities in the pattern of decarburization. For each treatment five specimens were tested.

* * *

The fatigue bending test was carried out by means of a testing apparatus by which the specimen was clamped on one side, and at a distance of 3/4 in. from the clamping point a reversing force was applied to bend the specimen up and down at a rate of 1200 per minute. Five specimens were tested at each of six degrees of treatment. The values obtained were strongly scattering, of which the cause is, on the one hand, the small dimensions of the specimens whereby even the least difference in the measurement would become noticeable, and on the other hand the greater influence of the irregularity of the decarburization. The results however show clearly that the fatigue bending strength is reduced as a result of the decarburization by up to around 20%. As these tests were carried out by to and fro bending stresses, they do not provide evidence of settling characteristics so very important in springs. The results of tests already initiated in this direction will be made public later on.

Possibilities of Recognition of Decarburization

Since decarburization occurs frequently only in spots in the wire coil, it is almost impossible, by tests from beginning to end, to say if the coil is quite free from decarburization or if a detected decarburization runs through the whole coil. Non-destructive testing procedures, as for example that by the known apparatuses Magnatest Q and Multitest by **F. Foster** utilizing induction action, are useful only for recognition of considerably stronger and deeper decarburization, because the other differences in characteristics act, within the range of usual tolerances, too strongly on the record. It is therefore impossible to detect decarburization by a run-through process. Respecting the test methods to be described it is only therefore to be remarked that they are dependable to give evidence of something about the pattern of decarburization in the wire coil, only in the degree of lengths and number of them taken for testing between the beginning and end of the coil. Inside the whole of an annealing charge, treated in common, a testing of all coil beginnings and ends will make possible a statistical evidence of the pattern of decarburization inside of the coils of the whole charge, so far as the material to be annealed is uniform and no inequalities exist in the annealing pot.

* * *

A very simple, but at the same time also rather inaccurate test method of recognition of decarburization is the breaking test. Several wire sections are hardened and then are bent by hand until they break. If no decarburization is present, then as a consequence of brittleness some particles will spatter away. If the surface is decarburized and therefore soft, then no breaking particles spring off; often the sound core breaks, and the soft surface skin holds together. With pronounced decarburization this method reacts surely, while it fails with not very deep partial decarburization.

* * *

Similarly simple, but almost exactly as unsure, is the file test: the hardened specimen is attacked with a fine file. If it is filed, then decarburization is present, while glass-hard undecarburized surfaces cannot be filed.

* * *

Far better is the hardness testing with the smallest possible weights. The effect of the decarburization on the surface hardness as determined by different weights has already been described (and illustrated in the original article). But the impracticality of this is that only flat surfaces can be so tested; round wire must be pressed flat before the hardening. A more serious disadvantage is further, that with only spotty decarburization the probability is not too good of hitting just a decarburized place with the small hardness impression. The hardness testing method is however appropriate for determining of acceptance tolerances, though the decarburized portions must be located by other means.

Clearly recognizable is every decarburization in the metallographic etched section, and indeed as readily in the unhardened as in the hardened condition. This testing however is time-consuming and limits the possibility of recognition exclusively to the sections selected. By this means the probability of a hit is greater than with the hardness test, because the whole circumference is included, but it remains still always small with locally occurring decarburization.

* * *

The utilization of the already mentioned appearance of the orange skin makes it possible to recognize at once decarburization on the surface. By the annealing the grain size of the ferrite of the decarburized outer layer increases greatly as compared to the undecarburized places. This coarse grain formation is recognizable on the surface if the material is deformed strongly plastic, as for example is the case of the tension test on the clamping spot. An example is represented in Fig. 4. Here only the

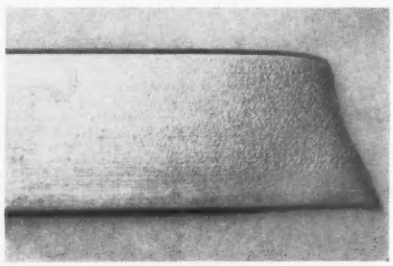

Fig. 4 — A specimen of flat wire of unalloyed steel with 0.78 % C broken in the tensile test. On the strongly plastic deformed places the partly present decarburization is noticeable as "orange skin." Magnification 3 times. * *

lowest strip is not decarburized, for the orange skin is not present there even on the strongly deformed stretch near the point of breaking. In the decarburized upper zone the orange skin disappears toward the left with decreasing extent of the deformation. This procedure of testing for decarburization is very simple, because frequently, apart from this, the tension test is carried out, and the specimens do not have to be first hardened. It fails however for very small wire diameters. The probability of hitting is greater than by the hardness test or by the metallographic etched section, because sometimes a predicted test length is picked up.

* * *

The greatest probability of an identification is attained by the pickling or etching process developed by P. Rump and his associates (not yet published). It rests on the fact that a decarburized layer is not as darkened by etching or pickling as one not decarburized. For a pickling solution, 6% nitric acid, for example, with dipping time of 15 to 20 seconds is suitable. Before pickling, the surface must be clean, bright and well degreased. After pickling the decarburized places appear brighter than the sound. Fig. 4 shows the specimen of Fig. 5 after pickling. It can be clearly recognized

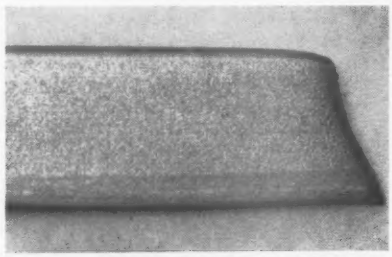

Fig. 5 — Same specimen as in Fig. 4 after pickling. The decarburization is now also distingushable on the not strongly plastic deformed places by the brighter color. * * *

that the broad decarburized strip spreads out also into the coil beyond the zone made visible by orange skin. The further illustrations (Figs. 6 to 8) are metallographic cross-sections through the corresponding zones. A disadvantage of this testing method is its over-sensitivity. Even quite insignificant places of partial decarburization of minimal depth are made visible, so that a further testing must follow to determine the degree and depth of the decarburization.

Fig. 6 — Cross-section through the specimen of Figs. 4 and 5 by 100 x magnification. The decarburized and un-decarburized positions are clearly differentiated. * * * * * *

Respecting the possibilities of recognition of the decarburization it must still be mentioned, that decarburization lamina after the hardening cannot be polished as well as the undecarburized. Mostly they appear somewhat darker.

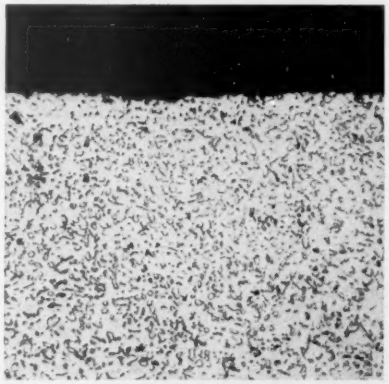

Fig. 7 — Cut-out from the un-decarburized side of Fig. 6 by 700 x magnification. * * *

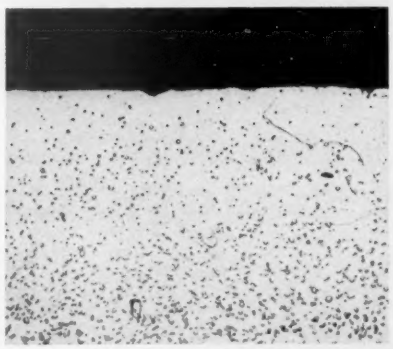

Fig. 8 — Cut-out from the decarburized side of Fig. 6. by 700 x magnification. * * *

Causes of Decarburization

Two different types of decarburization have to be distinguished, — hydrogen decarburization and oxygen decarburization. With hydrogen decarburization, which can occur under very high pressure (as for example by the ammonia synthesis) even at 482°F, hydrogen diffuses into the steel and results, in connection with decarbuformation, with the carbon. This results in connection with decarburization, in grain disintegration and the appearance of embrittlement. This kind of decarburization in which the depth of penetration can even after a short time become very great, occurs practically only with the use of steel at raised temperatures and pressures in atmos-

(*Please turn to page* 383)

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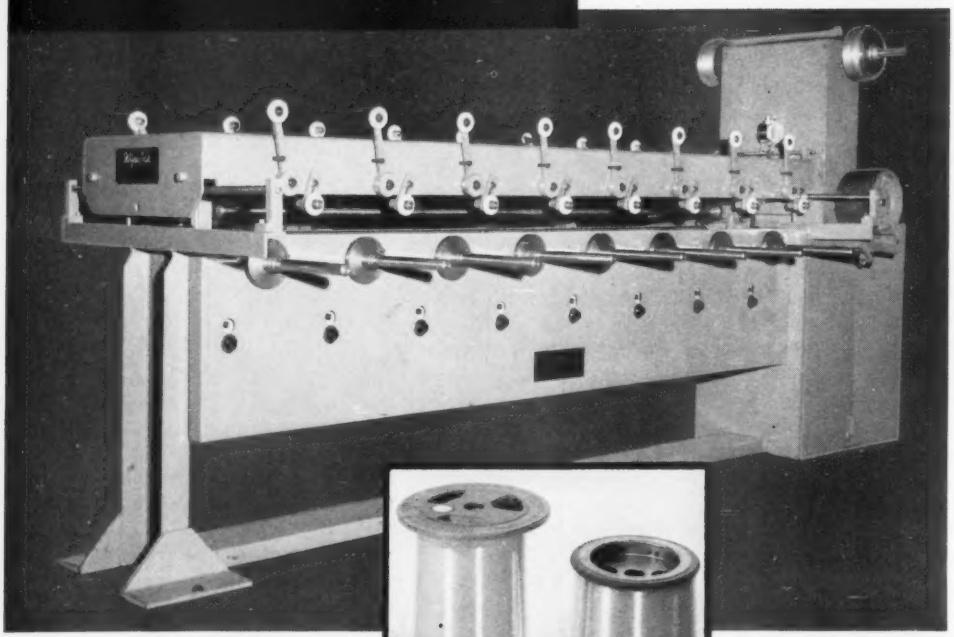

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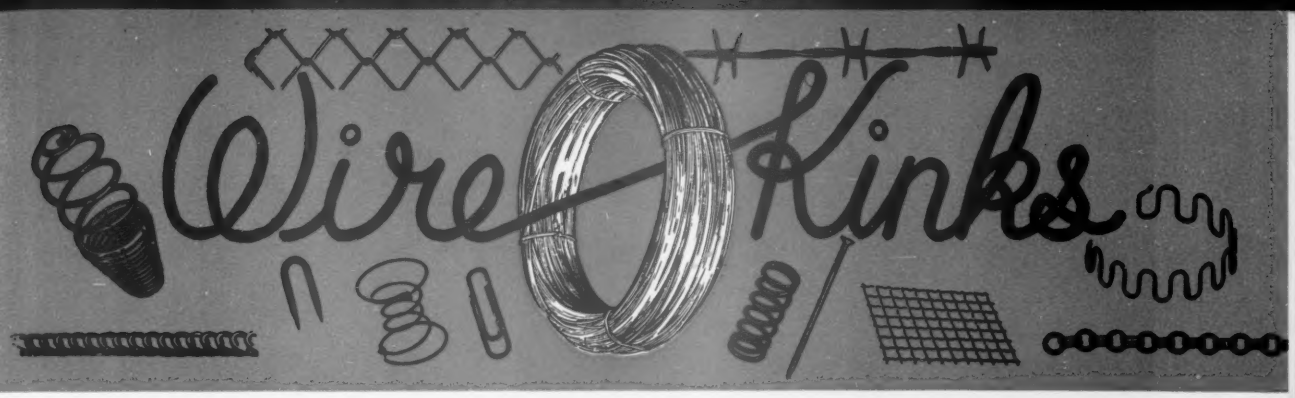


Machine Efficiency

Most wire machines today represent a sizable capital investment. Usually before a purchase is made management looks into the machine's rated efficiency with respect to production, cost of operation, etc.

* * *

What happens when the machine is placed in operation is a matter of good management, and while in theory a machine should always function at 100 percent efficiency, seldom if ever is this possible, due principally to the human factors involved.

* * *

Variations from the desired top performance may often be brought about by:

1. **Temporary failure of supplies.**
2. **Absenteeism of labor.**
3. **Labor inefficiency.**
4. **Variation in quality of material.**
5. **Poor lighting or operating conditions.**
6. **Mechanical breakdowns.**
7. **Inefficient maintenance resulting in low machine efficiency.**
8. **Inadequate or poor supervision.**

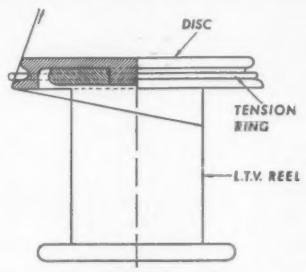
High-Speed Dereeling Device For Wire

Of very simple construction, but extremely efficient in operation, a new high-speed rereeling device for wire, developed by British Insulated Callender's Cables Limited at their Huyton Quarry Winding Wires Division, essentially consists of a precision-engineered metal disc holding a metal ring designed to fit into the lip of the disc, the disc resting on top of the long traverse verticle (LTV) reel, with the wire paid off between the lip of the disc and the metal ring. The device serves as an effective dereeler for long traverse vertical reels carrying up to 60 lb of wire in gauges from 0.0044 to 0.0124 in. and is easily installed.

* * *

Readers are invited to send us how-to-do-it items for this department. For each item received that is published we will pay contributors $10.00. Your cooperation will be appreciated by us and our many readers. May we hear from you?

By virtue of the weight of the ring, tension is applied to the wire during the dereeling operation, this being particularly important during the acceleration and deceleration periods occurring quite regularly during such operations.



During acceleration, the ring prevents the wire from overrunning, so that it never slackens off and falling turns do not occur. During deceleration, there is never any initial slack to take up, thereby avoiding the possibility of snarls. It is not necessary to restrain the wire as it winds from the reel, as there is no tendency for the wire to balloon outwards from the reel. Consequently, the wire is always on view and it is easy to estimate whether there is enough left on the reel at any given time to complete a winding.

The Lab and the Mill

In cold drawing steel wire, the amount of reduction is important in that to a certain degree it controls physical properties and finish.

* * *

The attainment of desired physicals by drawing is primarily set up by past experience, but when a new problem arises, the laboratory should be brought into the picture. Samples of wire must be drawn to the laboratory's ideas as to what should produce the proper properties and then tested.

* * *

This has to be repeated until a practical operating procedure can be set up. Laboratory control of production operations assures that the wire will meet specifications, avoiding excess cost and scrap, since the scale of laboratory operation is smaller than that of the mill.

Copper Bars and Annealing

QUESTION

Can you tell us something about the problems of uniformity in copper wire bars?

ANSWER

Of all the uses of copper in the electrical industry, probably that for insulated conductors is the most important.

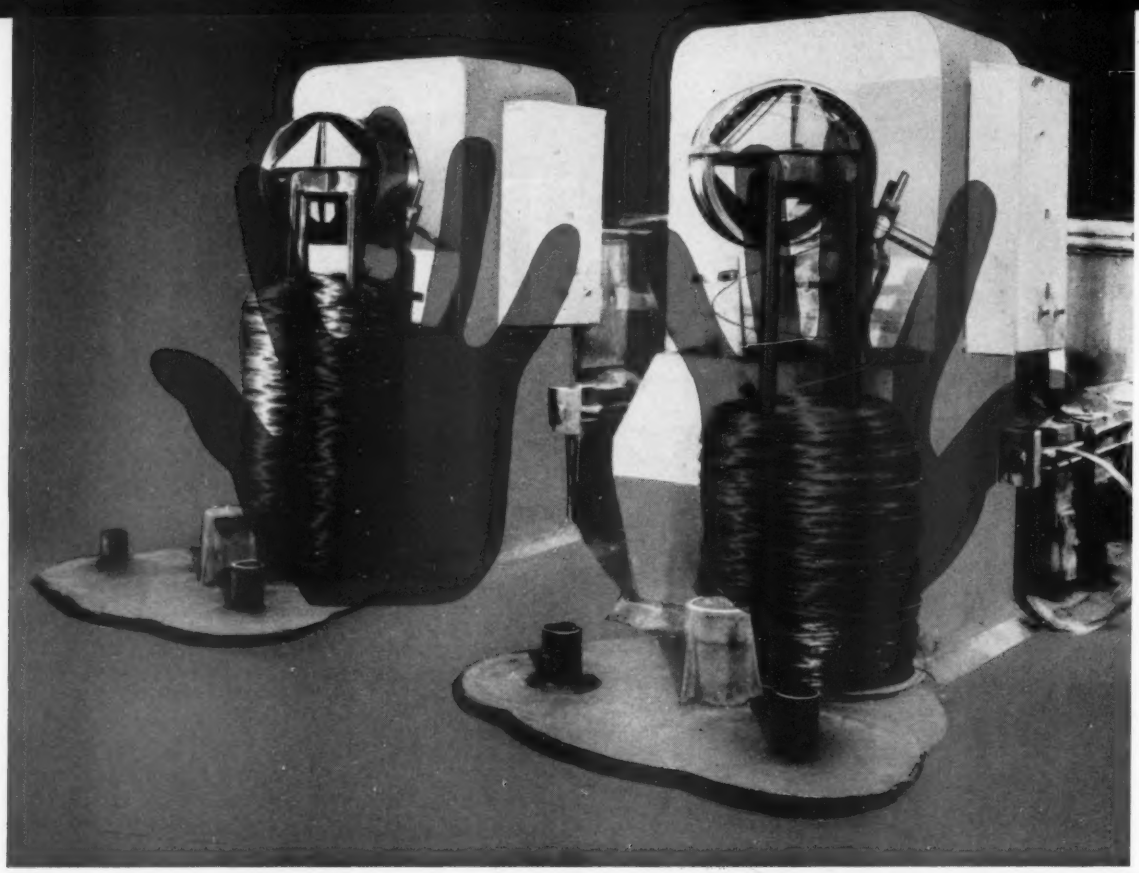
* * *

It is recognized that tough pitch copper rod from various refineries that is hot rolled by different mills does not respond uniformly to a standard annealing cycle after a specific amount of cold working. This was established by an investigation conducted by one mill in an effort to determine the causes of variations, which would appear unlikely to be due to chemical content.

* * *

Various tests eliminated one or another possible reasons, leaving one that appeared to be the primary cause — a physical difference caused by variations in rates of cooling. This was shown in rupture tests, in which bars slowly cooled from 800°C had a greater rupture strength than water quenched bars.

* * *



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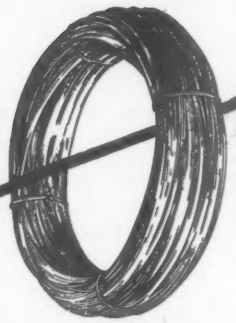
Wire Kinks



Depending upon the cooling rate, certain impurities present in the copper will exist in a solid solution or as an oxide. In tough pitch copper bars rapidly chilled from a high temperature, a number of impurities will form a solid solution with the copper that raises its annealing temperature.

* * *

Elements existing as oxides can be diffused into the copper by extended heating to 800°-850°C and maintained in that state by the quench. However, extended heating between 500° and 600°C will oxidize them, lowering the annealing temperature.

* * *

These phenomena should be taken into account if the ultimate wire is to have proper properties for uniform electrical conductors.

The Herman Process of Galvanizing

QUESTION

Could you give us an idea as to the construction and functioning of the Herman Process used by some mills in galvanizing steel wire?

ANSWER

The several methods of applying zinc to wire by the hot dip process differ very little in the galvanizing line to the point where the wires emerge from the spelter bath.

* * *

Standard lines are comprised of annealing equipment, such as lead pans, acid vats, fluxing tanks, spelter pan and take-up frames.

* * *

For the lightest coating, commonly called Type I, the wires emerge from the spelter bath at an angle of about 20 degrees with an exposure to the atmosphere of 8 to 10 inches. Then pass through wipes of asbestos rope into water cooling tanks, and on to the take-up blocks.

* * *

For heavier coatings, such as Type III, the wires pass through the spelter bath, but the angle of emergence is changed by having a sinker roll in the spelter bath that allows the wires to take a nearly vertical position in their passage to the guide sheaves above. If a charcoal wipe is used, a charcoal blanket covers the spelter in the area of exit from the bath.

* * *

In the Herman process, derived from a development of **Joseph L. Herman** of Peoria, Illinois, a device called the "Herman Galvanizing Machine" consists of an auxiliary spelter tank partly submerged in the main tank in the bottom of which is a slot large enough to permit the wires to pass upwards through the auxiliary tank from the main tank.

* * *

Plates are welded around this slot to form a riser about 10 inches high and a motor driven impeller pump circulates the molten zinc from this section back into the main bath. The space above the zinc is filled with natural gas to keep the zinc from oxidizing. A slot corresponding to the lower one is built into the top of the auxiliary tank to allow the wires to pass upwards toward the sheaves above.

* * *

In passing through the protective atmosphere the zinc partially solidifies and, upon leaving the auxiliary tank, passes through a water quench to complete the cooling.

* * *

The process keeps the wire coating bright and clean. Drainage of excess spelter takes place at a point and under conditions that make for uniform, concentric coatings. A noteworthy advantage of the machine is that much of the human element, based on the experience and judgment of the attendant, has been removed and uniform mechanical controls substituted therefor.

Braiding Wire Onto Bottles

QUESTION

We have seen wine bottles from Italy that are covered with braided wire. I believe the braided jacket is a cylindrical sleeve, into which the bottle is slipped, the sleeving being pulled at the top and bottom to make it conform to the bottle's shape, and then fastened in some manner. The bottles I have seen were coverd with a brass wire of about 26 or 28 gage.

* * *

Is there a machine that will perform this operation?

ANSWER NO. 1

"The inquiry you have received relating to the covering of wine bottles with a braided wire sleeve reminds me of braiding machines designed many years ago to cover odd shaped articles like rubber bulbs as well as unusual designs of wooden objects and pieces for fancy cords and straps.

* * *

"I would consider the principle involved to be similar and in the case of the objects which I have mentioned the machines were made with an open end so that the object to be covered was dropped into the machine at spaced intervals.

(*Please turn to page* 386)

Technical Papers for . . .

THE ANNUAL CONVENTION of THE WIRE ASSOCIATION

October 23-26, 1961, French Lick-Sheraton Hotel, French Lick, Indiana

There still is opportunity for those who are willing to present papers to volunteer. Papers may be placed in any of these categories:

- **FERROUS ROD, WIRE OR WIRE PRODUCTS**
- **NON-FERROUS MECHANICAL WIRE OR WIRE PRODUCTS**
- **ELECTRIC WIRE AND CABLE**

The title of the proposed paper and a brief summary of what you propose to cover should be sent to the Program Committee Member nearest you.

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For Electric Wire & Cable Section papers, write any member of the Non-Ferrous Program Committee or any member of the Electric Wire & Cable Management Committee listed elsewhere in this issue of Wire and Wire Products.

May we count on your cooperation?

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

453 Main Street **Stamford, Conn.**

"Fences Are Fine..."

by Mary Atkins, Teacher
Maryland

This little article, which describes some of the highlights of the study of wire fencing on the part of some youngsters, indicates the importance of guiding young minds in the development of their own ideas on a subject, thus "selling" themselves on the value of a type of product to them and the community in which they live. As may be surmised, the author is a grade school teacher.

During a study of safety in a second grade class, the pupils amazed their teacher with their knowledge of and interest in wire fencing. It seemed that fencing apparently had evidenced itself to them in many ways. The exhibit table showed homes, the school, and other important buildings, such as factories and electric power plants well "fenced in." The pupils used popsicle sticks painted with metallic paint to resemble steel, and did a realistic job. They showed, in their drawings, too, many kinds of uses for fencing. The children appeared to be well aware of the modern need for fencing.

* * *

The utilization of wire fencing in the exhibit and drawings led to a class discussion that evidenced much interest in the subject. Some of the children gave reports, after research and talking with parents, on the best kinds of fencing. They generally approved fencing that would last long, be very attractive, and would "do the job" — as one youngster said. "Keep in what you want, and keep out what you don't!"

* * *

They decided to explore the subject even further, so they delved into history books for pictures of old fences. Every possible fence was discussed; even the old wooden stockades that were built to protect our pioneer settlements. They talked about how much "more superior" today's modern fencing is. They mentioned electrical wire fencing, and its use. They took a trip outside to watch the new school playground have its fencing installed, and marveled at "how fast the fence erectors did the job!" They talked about fences in the old adage, "Good fences make good neighbors." Even seven and eight-year-olds are not too young to appreciate that!

Classroom exhibit showing stages from ore to finished steel products.

* * *

The children were keen to observe that fencing had two main purposes around school property: to protect children from dashing out after balls into the street, and to protect neighbors' nearby homes from balls also. They added that a fence actually beautified school property, as it seemed to add a "completeness" to everything. They took special note of the fact that some wire fencing was turned in at the top to discourage invaders or others who did not belong on school premises. Further, the pupils gained in an appreciation of those who manufacture fencing, and those who put it up.

* * *

During the safety and community studies, the children often built mock-up "fencing" around their play area right in the classroom. They gave their teacher the impression that as a group they liked the "protected and secure" feeling that fencing gave them. They changed the song called "Don't Fence Me In" to "Please Fence Me In for Safety's Sake," and their active interest doubtlessly helped the school authorities and P.T.A. to push along the school fencing project.

* * *

The pupils made special note of the progress in a fencing unit being erected around what had been considered a community menace for years — an old quarry hole that had become filled through the years with water. Many people feared traveling by this hazardous place, especially in bad weather. How glad the pupils were to report to their teacher on the daily progress of its fencing-in! They seemed happy to have extended their "fencing horizons" that much further!

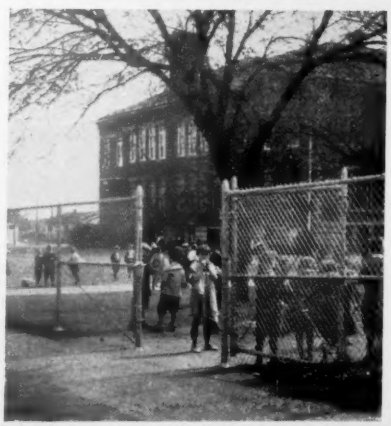
* * *

Some of the pupils came from farms, and spoke of the time-consuming and laborious process of erecting old-fashioned all-wooden fences still in use on some farms. They were not too young to sense the overall benefits of modern, steel wire fencing, which "stands the test of time." Many of them spoke of protection from "bad dogs" by good fencing, while they were out playing. "As good as a baby sitter", said one. Another said, "fences are fine..." He had been sure to report that **his** steel fence at home was superior to that of his neighbor's, which was a rose hedge fence, which, he said, "was pretty, but stickery, and didn't keep out the dogs!"

* * *

It was brought out in discussions

(*Please turn to page* 385)



Wire fence goes to school.

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Continuous Dry Blend Mixing Process for Polyvinyl Chloride Compound

by Emanuel J. George
Senior Engineer
Western Electric Company
Baltimore, Maryland

The author graduated in 1942 with B.S. degree in Chemical Engineering. His work assignments have been in the compounding, processing and application of synthetic elastomers and thermoplastic materials, in which work he now is specializing. This paper was published in the October, 1960, issue of the Western Electric Engineer and is copyrighted by Mr. George's company. It is published here through the courtesy of the Western Electric Company.

In the years that immediately follow every development job, the engineers involved can often list any number of different and in most cases better ways to solve the knotty problems that beset the group in the planning stage. Occasionally a process will withstand this intense scrutiny by its creators and their successors for a relatively long period of time. This is not to say that modifications are not made or thought of to update minor aspects of the system but that the basic concepts of the process are retained as being the most economical for the given situation. One such example of this is the continuous dry blend mixing process for polyvinyl chloride (PVC) compound at the Baltimore Works.

* * *

The continuous dry blend mixing process for PVC compound used at the Baltimore Works is a unique process developed by Western Electric engineers in 1950. It is a mixing technique used in the preparation of PVC formulations in powdered form for subsequent extrusion and was one of the first continuous mixing systems used in the industry. Essentially, it consists of mixing the solid components (resins, fillers, lubricants, stabilizers and pigments) with plasticizers and other liquid components in a series of kettles to obtain a homogenized dry blend at a continuous rate. This is done in a manner that produces a smooth flowing, sandy powder of uniform consistency. In contrast, the usual commercial type dry blend mixers are batch type units.

* * *

The developed heat of dry blend processed material is relatively low as the maximum temperatures reached are about 250 degrees Fahrenheit compared to 400 degrees Fahrenheit in the hot fusion process. Since the extrusion process itself generates heat in the compound, the less heat the compound has been exposed to prior to extrusion the less is the opportunity for decomposition of the compound during extrusion. This gives longer production runs at the extruders. Continuous mixing also gives a uniform dispersion of the ingredients which results in higher quality in the extruded product.

* * *

In addition, the hot compound from the mixer does not require special cooling equipment. With output geared to the demand, there is no need for large storage facilities.

* * *

Compared to the usual hot fusion process using a Banbury, roll-mill, and granulator setup; the dry blend process is much lower in equipment cost. Another advantage of this process over the hot fusion process is the low conversion cost as the usual cooling and granulating steps are eliminated, thereby cutting out that additional labor which would be required. Dry blend compound is also economical to handle because of its ability to be air conveyed.

* * *

The process of preparing plastic PVC compounds in dry blend form at Baltimore may be divided into three operations; namely, weighing, mixing, and conveying of the compound to the point of use at the extruder. An electromechanical control system synchronizes these operations. It governs the flow of compound to the extruders based on the demand of the extruders. The control system also stops the mixer if any part of the system is not functioning properly. This insures that the compound being mixed is in accordance with the desired formula.

* * *

The master control includes provisions for changing formulae by activating or deactivating weighing positions. Also, by a simple manual adjustment at the individual weighing positions, the proportion of any ingredient can be varied. This gives the mixer the ability to mix a variety of compounds. A schematic diagram of the entire process is shown in Figure 1.

* * *

The weighing operation consists of three distinct steps: first, the storing and conveying of the ingredients to the weighing station; second, the weighing operation itself and third, the conveying of the weighed material to the mixer.

* * *

A series of conical hoppers is used to hold the PVC resin and the powdered ingredients such as clay, whiting, stabilizers, lubricants, and coloring materials (for jacket compounds only) at the weighing station. All of these hoppers, excluding the resin hopper, hold sufficient material for about four hours' production. Thus, the hoppers require loading twice per shift. The resin hopper is automatically loaded by an air conveyor from a large storage bin. This eliminates the manual handling of large quantities of resin. The

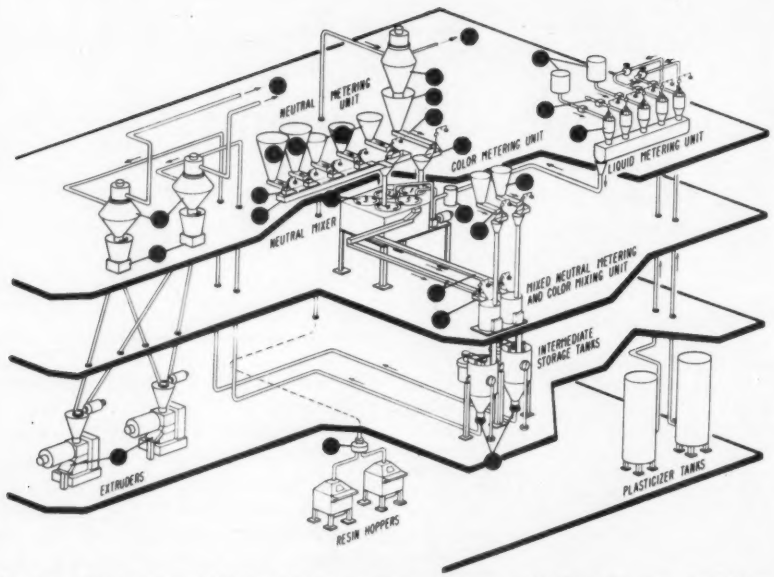

Fig. 1 — PVC Compound Mixing System. 1. Selector Valves; 2. Airborne Conveyor Separators; 3. To Vacuum Pump in Dust Collector Room; 4. Conveyor Control Panel; 5. Clay Hopper; 6. Whiting Hopper; 7. Variable Ingredient Hoppers; 8. Resin Hopper; 9. Vibratory Feeders; 10. Kettle; 11. Fluids Heater; 12. Weigh Pans; 13. Tanks for Gravity Feed; 14. Oil; 15. Weigh Cans; 16. Coloring Material Hoppers; 17. Conveyor Feed Nozzles. * * * * * * * *

powdered ingredients flow by gravity from the hoppers to chutes which in turn convey the material to the weighing device.

* * *

The hoppers and the loading chutes are equipped with vibrators to insure a uniform and constant flow of material to the weighing device which consists of a balance or scale set for weighing a predetermined amount of material. A weigh pan receives the material from the loading chute (See Figure 2). Each weighing position is designed to handle a broad range of weights of any particular ingredient. Changing the formula being mixed is a simple operation and requires only changing the predetermined weights on the scale.

* * *

The liquid ingredients, mainly plasticizers and oils, are pumped from storage tanks to the weighing positions by an automatic system which delivers the fluid at a constant pressure. The weigh pan, in this case, consists of a vessel with an electromagnetically operated plunger type valve at the bottom (See Figure 3). After fluids flow from the weighing vessel, they are heated to 180 degrees Fahrenheit, and pumped to spray nozzles in #1 and #2 kettles of the mixer. To illustrate the weighing operation of this process, a typical insulating formula, such as shown below, would require seven weighing positions. For example, the clay weighing position operates as follows :the powdered material falls by gravity from the storage hopper to a chute below, and it is then vibrated into the weigh pan.

Ingredients	Formulation in Parts	Weights Charged per Cycle
PVC Resin	100	3000 grams
Plasticizer	60	1800 "
Stabilizer	10	300 "
Clay	10	300 "
Whiting	10	300 "
Lubricant	1	30 "
Color	1	30 "
Total	192	5760 grams

When the weigh pan has received the 300 grams, the beam of the balance moves to a level position and stops the vibrators on the chute which in turn stops the flow of material from the hopper. Then, time relays energize other vibrators which are attached to the weigh pan and cause it to vibrate the weighed material onto the conveyor chute below (See Figure 4). This conveyor chute is also vibrated and carries all the powdered ingredients, except the resin, to #4 kettle in the mixer.

* * *

The flow of ingredients from the

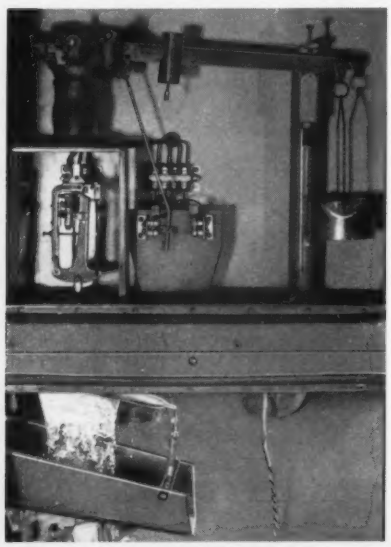

Fig. 2 — Weigh pan being loaded. * * *

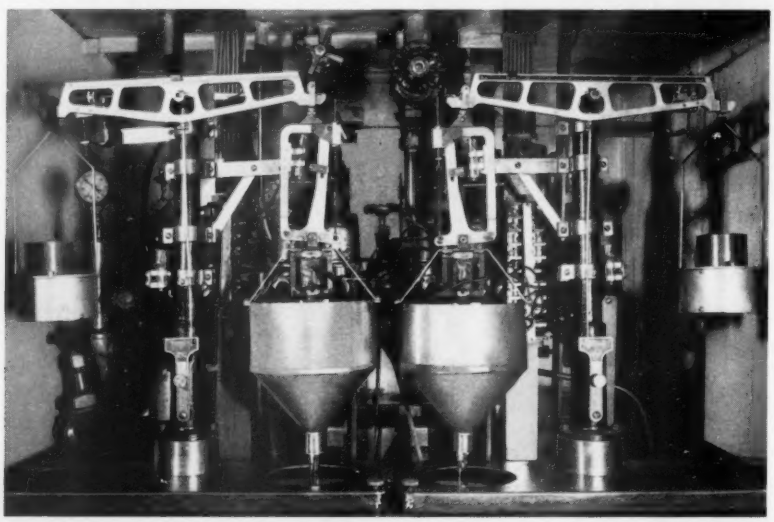

Fig. 3 — Plasticizer being discharged into conveyor. * * * * * * * * * * * *

storage hoppers and storage tanks to the weighing positions, the weighing of the ingredients, and the flow of ingredients to the mixing kettles are regulated by the master control in the above sequence. For each cycle, all three steps take place within the present 90-second cycle.

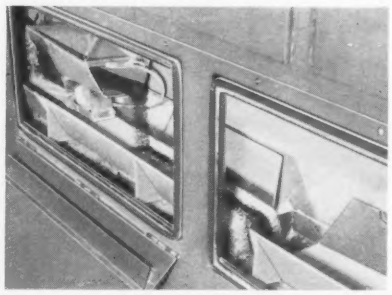

Fig. 4 —Weigh pan discharging into conveyor.

The mixing operation is performed in five interconnected stainless steel kettles. The kettles are cylindrical in shape, approximately 20 inches in diameter and 20 inches deep, and are fitted with a stainless steel cover. Each kettle is equipped with a U-shaped agitator which is rotated at 300 rpm by a five-HP electric motor through V-Belts and a worm gear reduction unit. The two-arm agitator sweeps across the bottom and the side walls of the kettle. A conical central portion deflects material falling on it outward towards the blades. The outer edges of the blades are approximately one-half inch from the kettle walls. In operation, each kettle contains approximately 50 pounds of material.

* * *

The mixing action occurs as the blades rotate and push the material around and to the perimeter of the cylinder. The powdered material freely slides off the blades and drops to the bottom of the kettle from which it is repeatedly forced outward and upward. This movement places the particles under a continuous shear action between the smooth walls of the kettle and the blades. The powders are in a fluidized state and mixing occurs in an action similar to a liquid. The high shear stress readily breaks up agglomerates and the particles are completely intermixed in a matter of a few seconds. The frictional heat generated is sufficient to raise the temperature of the mass to a maximum of 200 degrees to 250 degrees Fahrenheit depending on the particle size of the PVC resin. Each kettle is surrounded with coils for cooling as required to obtain the desired mixing.

* * *

The five kettles of the mixing unit are positioned so that oblique slots, cut in the walls at the point of tangency of the cylindrical kettles, allow the transfer of material from one kettle to another. Each slot is directed with its entrance facing opposite to the direction of movement of the agitator so that the material is forced through the slot as the blades approach it (See Figure 5). There is a transfer slot one-half inch wide and six inches long at the upper section of each point of tangency between kettles 1 and 2, 2 and 3, 3 and 4, 4 and 5, and at the top of kettle #5 to the discharge chute.

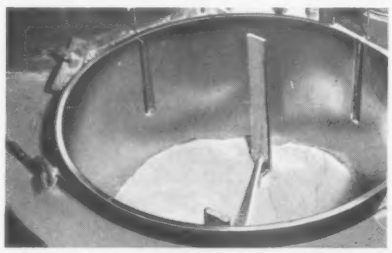

Fig. 5 — Opened mixing kettle showing blades of agitator and transfer slots.

The agitator in the first kettle rotates counter-clockwise. The agitator in the second kettle rotates clockwise and so on, alternating directions from kettle to kettle to effect the desired flow of material through the transfer slots.

* * *

PVC resin is dropped through a chute into the first kettle, and heated plasticizers are sprayed through nozzles into the first and second kettles. Powdered materials from the neutral metering unit are dropped through another chute into kettle #4. The first kettle is heated continuously with steam at 30 psi to raise the PVC resin temperature to approximately 180 degrees Fahrenheit. This applied heat speeds absorption of the plasticizers and oils by the PVC resin. The generation of frictional heat aids in raising the temperature, so that the final exit temperature of the compound is 220 degrees to 250 degrees Fahrenheit. Cold water is circulated through the cooling coils of kettles 2, 3, 4, and 5 to remove excess heat.

* * *

The totally mixed material which leaves the mixer in a continuous stream during a given period equals the total unmixed ingredients added during that period. Thus, the small incremental additions of ingredients totaling about 13 pounds for each 90-second cycle results in a steady flow of compound at an approximate rate of 520 pounds per hour.

* * *

Adding the plasticizers to the resin in the first two kettles allows for complete solvating action by the plasticizer on the surface of the resin particle. This results in the plasticizer being locked in the particle so tightly that it cannot be wiped or absorbed from the resin itself. Thus, the addition of the powdered ingredients in kettle #4 does not result in a wet mix. Subsequent mixing becomes a matter of blending the plasticized but dry resin with powdered ingredients. This gives a sandy, free-flowing powder of uniform composition.

* * *

The master control system regulates the operation of the mixer. If a kettle becomes overloaded the machine is automatically stopped. To correct this condition an operator manually corrects the overload and recycles the process. Thermocouples are located in the transfer slots between the kettles and at the discharge chute so that temperatures at all points can be checked.

* * *

In cases where a variety of colors is desired, the color pigment is withheld from materials charged into kettle #4 and neutral base mix from kettle #5 is conveyed to one of a series of coloring units. Each color unit consists of an automatic weighing position for weighing a predetermined amount of base compound and the desired amount of color pigment. These are dropped into a mixing kettle similar to that used in the prepa-

(*Please turn to page* 388)

COMING EVENTS

OF

THE WIRE ASSOCIATION

April 26, 1961 — Meeting of the Board of Directors at the Sheraton-Atlantic Hotel, New York, N. Y., at 10:00 a.m.

The Electric Wire and Cable Management Committee will meet at 2:00 p.m. on this date.

April 27 and 28, 1961 — Regional Meeting of the Electric Wire and Cable Section, Sheraton-Atlantic Hotel, New York, N. Y. A plant visit to Bell Telephone Laboratories in Murray Hill, N. J., has been arranged for April 27, with technical sessions on April 28.

June 22 and 23, 1961 — West Coast Regional Meeting of The Wire Association at the Jack Tar Hotel in San Francisco, California, with a plant inspection tour of Bethlehem Steel Company's wire mill in South San Francisco.

October 23-26, 1961 — Annual Convention of The Wire Association at French Lick, Indiana, with the French Lick-Sheraton Hotel as headquarters.

October 22-25, 1962 — Annual Convention of The Wire Association at the Lord Baltimore Hotel, Baltimore, Maryland. Plant visits to Bethlehem Steel Company at Sparrows Point and to Western Electric Company's Point Breeze works will be made.

Members are asked to note these dates on their calendars and are invited to make any advance inquiries desired on these coming meetings.

THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

453 Main Street **Stamford, Conn.**

Government Screw Thread Standards

Screw-Thread Standards for Federal Services, 1957, Part III, National Bureau of Standards Handbook H28 (1957) — Amends in part H28 (1944) (and in part its 1950 Supplement), issued October 7, 1960, 66 pages, 60 cents. (Order from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.)

* * *

This volume is the third of a series of three into which the 1957 edition of NBS Handbook H28 is divided. It covers Acme, Stub Acme, and Buttress threads; rolled threads for screw shells of electric lamp holders and unassembled lamp bases; microscope objective and nosepiece threads; surveying instrument mounting threads; ISO metric threads; miscellaneous threads; Class 5 interference-fit threads, trial standard; and wrench openings.

* * *

The Handbook represents the work of the Interdepartmental Screw Thread Committee, which is sponsored by the Departments of Defense, Army, Navy, Air Force, and Commerce to promote uniformity in screw-thread standards in the Departments concerned. The Handbook is based on the 1933 and earlier reports of the National Screw Thread Commission and NBS Handbooks H25 (1939) and H28 (1924 and 1944), together with pertinent standards approved and promulgated by the American Standards Association.

* * *

Part I, published September, 1957, price $1.25, includes standards for screw threads which are commonly applied to bolts, screws, nuts, and other similar fasteners. Such threads are variously designated as Unified, American, American National, and Unified Miniature threads.

* * *

Part II, published November, 1959, price 75 cents, includes standards for pipe threads, including dryseal pipe threads; gas cylinder valve outlet and inlet threads; hose coupling, including fire-hose coupling threads; and hose connections for welding and cutting equipment.

Note: Foreign remittances must be in U. S. exchange and should include an additional one-fourth of the publication price to cover mailing costs.

New Government Publication

Heat Treatment and Properties of Iron and Steel, by **Thomas G. Digges** and **Samuel J. Rosenberg,** National Bureau of Standards Monograph 18, issued October 3, 1960; 40 pages, 35 cents. (Order from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.).

* * *

The Bureau receives many requests for general information concerning the heat treatment of iron and steel and for explanations of such processes. This monograph has been prepared to answer such inquiries and to give, in simplified

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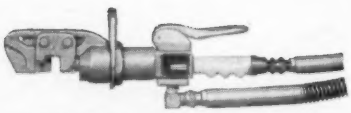
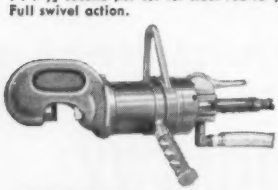


MODEL MC 210 Capacity ½" High speed . . . ½ second per cut for steel rod to ½". Full swivel action.



MODEL MC 35 Capacity 1" Cuts high carbon material including reinforcing rod and heat treated chain to 1" diameter in 1¼ seconds per cut.

MODEL MC 65 Capacity 1¼" Cuts 1¼" diameter steel in 2 seconds per cut. Can be modified to cut 1⅝" diameter aluminum.

Big Time and Money Saver for Rod Mills and Users of Wire and Rod

Ideal for production cutting, trimming off cobbled ends, taking test samples and splitting bundles on docks.

Manco has completely redesigned the Guillotine line of wire and rod cutters now used by major rod mills throughout the world. These new Manco Guillotine units give high efficiency, heavy duty performance, with a 75% slash in tool maintenance costs.

New Interchangeable Blade and Anvil

Interchangeable blade and anvil means wear points can be reversed for virtually double life. Three blade styles for various cutting requirements. There is a new simplified valve design with hardened and ground parts for longer life. Also, new Meehanite piston with large bearing surface and a new piston seal assembly that permits quick replacement.

These Guillotine units powered by Manco Hi-Thrust Electric Hydraulic Pumps

Write for Complete Information W-3

WRITE FOR CATALOG

MANCO MFG. CO., Bradley, Illinois
Please send:

☐ Catalog of new Guillotine Wire and Rod Cutters.

Name .....

Firm .....

City ..... Zone ..... State .....

form, a working knowledge of the basic theoretical and practical principles involved in the heat treatment of iron and steel. The effects of various treatments on the structures and mechanical properties of these materials are described. Some theoretical aspects and technical details are discussed only briefly or omitted entirely for better understanding of the general subject.

* * *

The monograph also contains a complete listing of all current structural, tool, and stainless steels, and their recommended heat treatments.

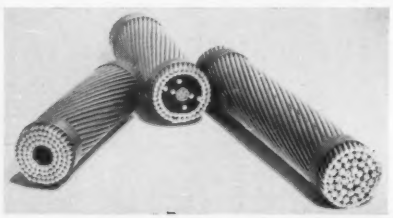
Note: Foreign remittances must be in U. S. exchange and should include an additional one-fourth of the publication price to cover mailing costs.

New Type ACSR

Two unique high voltage electrical conductors have been specially developed by **Rome Cable Division, Aluminum Company of America,** for Bonneville Power Administration. They will be installed on a 460-000 volt test line to be constructed in the spring near Sandy, Ore.

* * *

The new Alcoa conductors are of expanded design, but represent



Standard ACSR (Center); ACSR with flexible conduit core (left); and ACSR with rope lay configuration (right).

considerable departure in concept — and expanding medium — from the familiar Expanded ACSR. Made entirely of aluminum, they were developed to specifications requiring all-metal construction.

* * *

One conductor design employs a "rope lay" configuration measuring 2.13 inches in diameter, the first time such a concept has been applied to a conductor of this size.

* * *

The other new conductor incorporates a flexible aluminum con-

duit as the expanding medium. Its stranding consists of four layers of 5005 alloy wire helically wound around the core. Overall conductor diameter is 2.14 inches; the flexible conduit core is a standard .825-inch O.D. flexible conduit.

* * *

Alcoa's Rome Cable Division is one of five manufacturers supplying conductors for the Bonneville test line, latest of a growing group of EHV (Extra High Voltage) transmission investigations.

Large Diamonds Made By GE

For the first time in history, man has made large diamonds, according to **Dr. Guy Suits,** General Electric vice president and director of research. The large diamonds are over a carat in size. They are dark in color, however, and, because of structural imperfections, they are not yet of sufficient mechanical

Group of carat-sized man-made diamonds made in G.E.'s Research Laboratory seen against a 1-inch scale.

strength for industrial application.

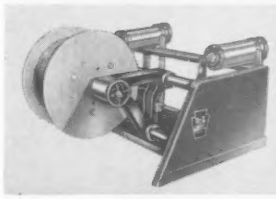
* * *

This scientific feat was achieved at the **General Electric Research Laboratory** in Schenectady, where the first man-made diamonds were announced in 1955. These new, large diamonds are the latest milestone in a high-temperature, high-pressure research program that General Electric has pursued since its initial success in converting common graphite into diamonds.

* * *

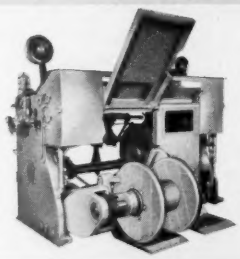
Dr. Suits pointed out that the large diamond work is still in the early development stage and it is impossible to predict when they will succeed in making large diamonds with mechanical properties comparable to the small artificial diamonds, which have proved to

MATCHED COMPONENTS
mean Precision Extrusion Control



D-S "Matched Component" Wire Line Systems

Pay-offs • Extruders
Cooling Troughs • Capstans
Take-ups • Horizontal and
Vertical CV • Complete Line
of Accessory Equipment



"Matched Component" wire Insulating Systems increase productivity and eliminate wasted capacity. From missile wire to transoceanic cable, D-S properly-designed components give better quality at lower cost.

- Wire line speeds up to 4000 feet per minute
- Reel sizes to 120" diameter
- Complete Systems for all types of thermoplastic and rubber insulating lines

Anything less than D-S "MATCHED COMPONENT" capacity is costing you money

• Get complete details by return mail •

PRECISION EXTRUSION CONTROL IS OUR BUSINESS

D-S thermatic

DAVIS - STANDARD
Division of
FRANKLIN RESEARCH AND DEVELOPMENT CORPORATION
8 WATER STREET, MYSTIC, CONNECTICUT

Preliminary Announcement Of
The West Coast Regional Meeting
of
THE WIRE ASSOCIATION

June 22-23, 1961, Jack Tar Hotel, San Francisco, Cal.

PROGRAM SCHEDULE

Thursday, June 22

10:00 A.M.—Registration

2:00-5:00 P.M.—Technical Session. Six papers will be presented, each on a timely subject.

Friday, June 23

9:30 A.M.—Plant Inspection Trip. Busses leave the hotel for a visit to the South San Francisco Mill of Bethlehem Steel Corp. Particular emphasis will be placed on the Bolt Department.

Luncheon will be served at the International Inn.

The return trip will be made via the Scenic Coast route for the enjoyment of the group.

6:30-7:30 P.M.—Hospitality Hour. This will be sponsored by Bethlehem Steel Corp., The Colorado Fuel & Iron Corp., Columbia-Geneva Steel Div. of U. S. Steel Corp., Planett Mfg. Co., John A. Roebling's Sons Div. of C.F.&I., and Wire Specialties Co.

7:30 P.M.—Dinner. Door prizes will be distributed and a top-notch after-dinner speaker will address the gathering. Ladies are invited.

This meeting gives every promise of upholding the traditional hospitality and interest of our West Coast Regional Meetings.

All wire men are cordially invited to be present for the full schedule of events. Make your plans now to be in San Francisco on the 22nd and 23rd of June.

Full program details next month

THE WIRE ASSOCIATION

Richard E. Brown, Executive Secretary

453 Main St. **Stamford, Conn.**

be superior to natural diamonds for many industrial applications. GE industrial diamonds are of the utmost strategic importance today, since the major source of natural diamonds is the Congo, and uncertain conditions there make it fortunate that industry can turn to man-made diamonds for cutting, grinding and polishing. Millions of carats of industrial diamonds have been manufactured by General Electric's Metallurgical Products Department in Detroit since 1957.

New Heavy-Duty Wire Drawing Machine

Increased wire production with minimum maintenance and operator skill results from the "Beeline" Model DG-5 straight-line non-slip design, according to **MH. Machines,** U. S. sales and service representatives, Cleveland, Ohio.

* * *

Designed for manual, semi-automatic or fully automatic operation, this unit-built Model DG-5 wire drawing machine features any number of drawing blocks, each individually operable with electrically controlled back tension at each block, and designed to coordinate with each other once the stringing operation is completed. This heavy-duty machine emphasizes a slow pulling-in speed to avoid strains or wire-breakage. Each successive block is so designed that an approximate 20% difference in block speed at the same motor speed exists between successive blocks.

* * *

Ruggedly built with worm gears made of nickel-chromium steel, precision-ground and lapped for smooth, vibration-free high-speed operation, the worm wheel rims are made of centrifugally cast special bronze, precision cut and finished. Drawing blocks are made of cast iron with hardened drawing zone for maximum wear resistance.

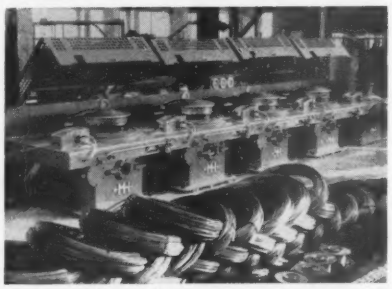
* * *

The "Beeline's" simplified straight-line design reduces maintenance by having fewer moving parts. Suitable for all types and grades of material from high-tensile steel to pure aluminum, the Model DG-5 can be operated in any

number of blocks. Basically, this machine has five 28" diameter blocks, with fully installed power rated at 408 h.p., maximum rod capacity of ½" diameter .85% carbon patented steel. Its finishing speed is continuously adjustable from 0 to 700 feet per minute.

* * *

Manufactured by **AB Arboga Mek. Verstad** of Arboga, Sweden, a subsidiary of Morgardshammar of Sweden, the "Beeline" Model DG-5 with five blocks designed for



Model DG-5 Wire Drawing Machine

manufacturing wire used in prestressed concrete can be delivered complete to the customer in the United States from $75,000, including duty, according to **Y. B. Bengtson,** Manager of MH. Machines, who installs and services the machines and maintains a complete spare parts stock for prompt delivery.

* * *

Information on this Model DG-5 can be obtained by writing to Y. B. Bengtson, at MH. Machines, 19002 Lomond Blvd., Cleveland 22, Ohio.

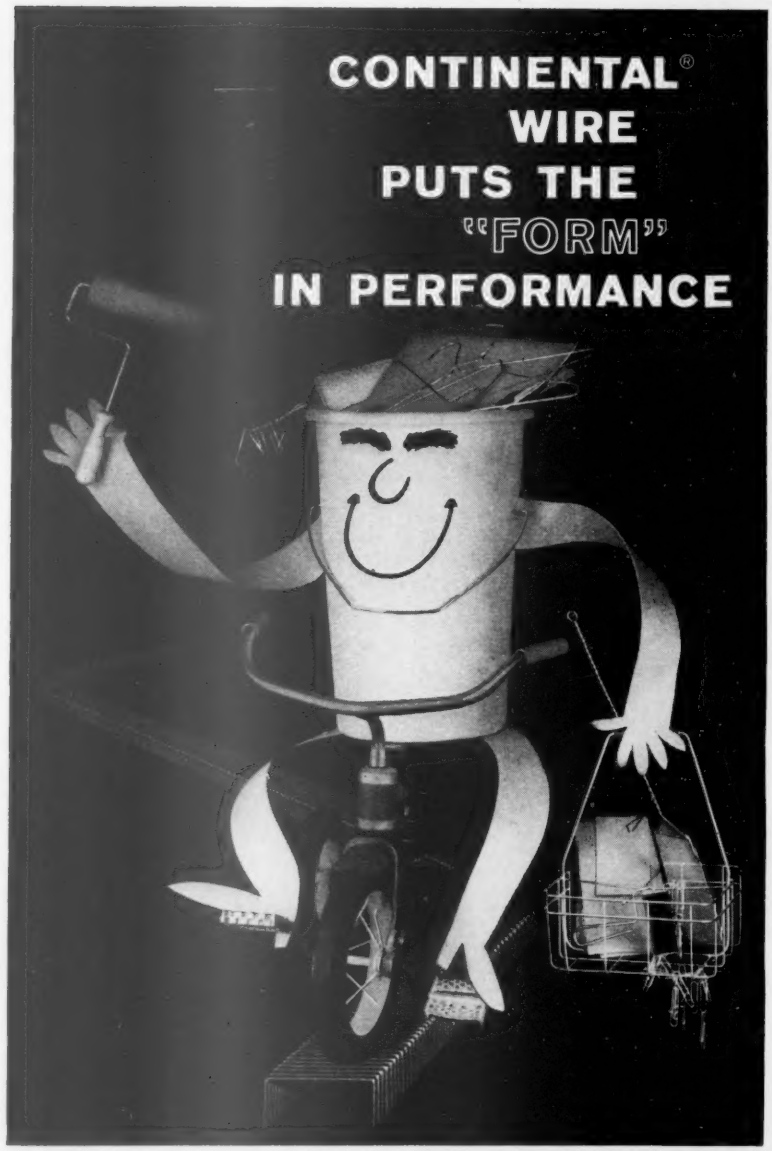
Four New PVC Polymers Announced

Four new and improved vinyl chloride polymers with a broad range of balanced properties recently were announced by **Monsanto Chemical Company**'s Plastics Division.

* * *

M. G. Caine, product sales manager, described the new materials as a new plastisol resin with excellent clarity and stability, designated Opalon 440, and the first three of a new Opalon 600 series of suspension resins, with improved heat stability, color and processability, for extrusion, molding and calendering.

* * *



Formability that permits difficult twists and bends . . . sustained fast production in coil after coil . . . smooth tight coatings that do not powder, flake or peel to jam machines. Such wire calls for consistent, uniform quality. You can get it at Continental, in sizes and finishes to meet most specifications—from ⅜" on down to 40 gauge, in various tempers and analyses, in low and medium low carbon steels. Special shapes, too. Why not let our mill technicians work with you on any problems you may have pertaining to wire fabrication. We may have the answer to a particular need. Write today for your FREE copy of our new wire manual.

Wire Specialists for over half a century

CONTINENTAL STEEL
CORPORATION KOKOMO, INDIANA

PRODUCERS OF Manufacturer's Wire in many sizes, tempers, and finishes, including Galvanized, KOKOTE,® Flame Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright and special shaped wire. Also Welded Wire Reinforcing and Galvanized Fabric, Nails, Continental Chain Link Fence, and other products.

no worry!

Even if those Apco Mossberg Reels do fall, they won't be damaged because of their all-steel construction. They're designed and manufactured to close tolerances too, so you will have no worries about breakage, tapping or wire waste.

With Apco Mossberg Reels and Spools, machine downtime and maintenance are at a minimum.

Fifty years of experience behind these reels assure smooth spool-out at high speeds. For additional information, write, wire or call collect.

PACIFIC COAST REPRESENTATIVE:
Gordon Proffitt
World Trade Center
Ferry Building
San Francisco 11, Calif.

CANADIAN REPRESENTATIVE:
Hugh P. Williams & Co.
47 Colbourne Street, West
Toronto, Ontario, Canada

APCO MOSSBERG COMPANY
LAMB STREET, ATTLEBORO, MASSACHUSETTS

The three suspension homopolymers in the 600 series are: Opalon 660 (specific viscosity — 0.55), Opalon 650 (specific viscosity — 0.48) and Opalon 630 (specific viscosity — 0.39).Two more, with even lower specific viscosities, will be ready soon. All of them, he said, have excellent dry blending characteristics and combine outstanding color, clarity and long-term heat stability with exceptionally fast processing at high quality levels. Specific viscosities vary directly with molecular weights, permitting a choice of resin to suit a particular process or application.

* * *

Opalon 660, a high molecular weight fast-mixing resin is especially recommended for wire and cable extrusion compounds. Such compounds and dry blends are capable of being extruded continuously at high output rates with smooth appearance and good physical properties. Its low gel count and smooth non-grainy surface permit high production rates of profile products requiring excellent appearance, according to Caine.

New High Temperature Vinyl Compound Announced

A new vinyl compound designed to meet the needs for 90°C appliance wire, hook-up wire and government specifications for 1/32″ and 1/64″ wall thickness has just been introduced by **The Blane Corp.,** Canton, Mass.

* * *

The compound, #9101 is the result of continued research and development and is an outgrowth of the work done on the company's #8100 compound. It is meeting the wire and cable industry's need for a 90°C vinyl compound and passes UL requirements after 7 days aging at elevated temperatures where a complete margin of safety is required. It also meets CSA requirements of 14 days at 121°C with a very high margin of safety.

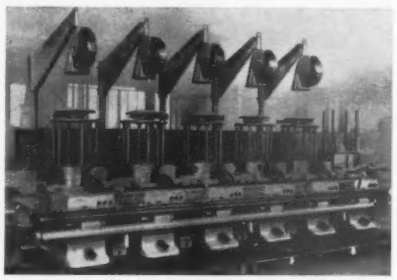
* * *

No. 9101 has outstanding high and low temperature characteristics that make it a versatile material for many applications. Fur-

ther information on compound #9101 may be obtained by writing direct to: The Blane Corporation, Canton, Mass.

New Wire Drawing Machine Announced

Straus-Artys Corp. has announced an addition to its Malmedi Multiple Wire Drawing Machine line. These new machines arranged with independent motor drives are particularly suitable for low-torsion and non-twist drawing



of wire. The individual motors are mounted below or behind each block.

* * *

Each vertical capstan can be independently driven. When the machine is completely threaded up, the machine as a complete unit can be set into operation by engaging automatic controls. A water cooling system supplying both capstans and dies is provided, with additional air-cooling system optional.

* * *

Rapid stopping features in case of wire breakage or accidents have been incorporated. A central lubricating system adequately supplies lubrication to all gears and bearings. The machine is made in five different models.

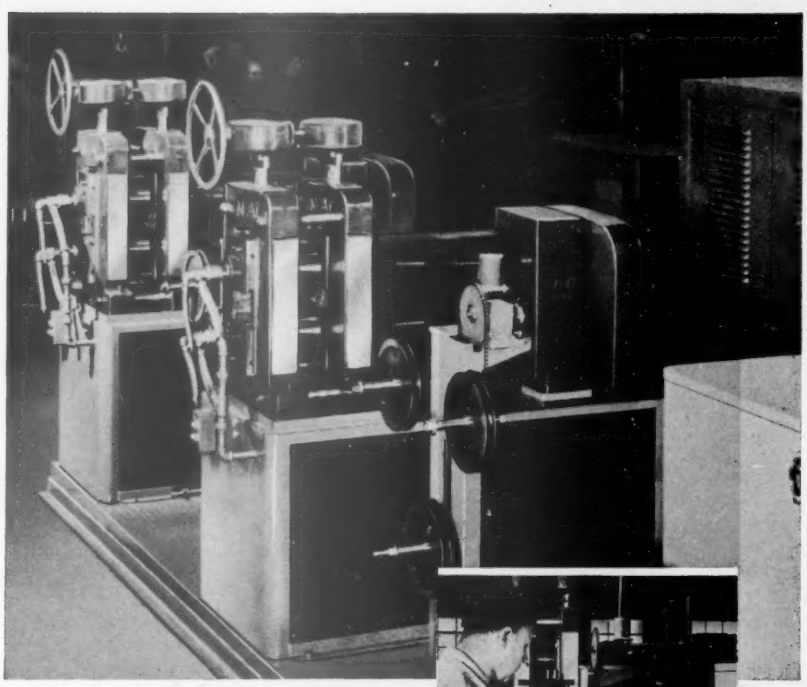
* * *

Further information and Free Decimal and Wire Gauge Charts are available from Straus-Artys Corp., 45 No. Station Plaza, Great Neck, N. Y.

New High Speed Portable Rod Cutter

Manco Mfg. Co. of Bradley, Illinois, announces its new Model MC-205-K portable cutter which develops five tons of thrust to cut through a 7/16 inch mild steel rod in three seconds.

* * *



HIGH PRODUCTION *Wire Flattening* **MILLS**

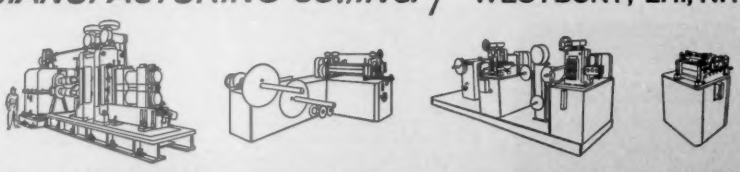
Now you can get extremely close tolerances combined with high speed production, with Stanat Wire Flattening Mills. These Stanat mills can be used to produce a wide variety of flat and shaped wire.

Designed to offer maximum flexibility of operation and arrangement, Stanat mills are available either as completely self-contained package units or as individual components for erection at your plant.

Stanat wire mills are available in 4", 6", 8" and 10" roll diameters, with optional equipment to fit your individual production requirements.

■ Find out how you can get increased production and greater profits with Stanat Wire Mills. Write today for further information.

STANAT MANUFACTURING CO., INC. / 500 SHAMES DRIVE WESTBURY, L. I., N.Y.



MFR'S OF ROLLING MILLS, GANG SLITTERS, WIRE FLATTENING MILLS, ROLLER LEVELERS AND BULL BLOCKS

handles blank lengths up to 4" and thread lengths up to 2½" on diameters from ⅜" to ⅝"

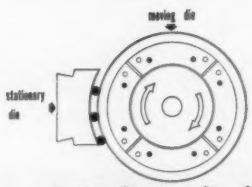
Model 200 PRUTTON Planetary Thread Roller

BEAT RISING COSTS with GREATER machine OUTPUT

Thread rolling large diameters at speeds up to 250 pcs./min. widens your profit margin as only the Prutton Planetary System can. Since one Prutton Machine replaces up to four reciprocating machines—it pays for itself in a hurry. Requires only 1/3 the floor space. Users report up to 65% savings in man hours—that a Prutton costs only 1/3 to 1/2 as much as conventional machines for an equivalent output.

LET THE PRUTTON PLANETARY DIE END "Lost Motion" IN YOUR PLANT . . .

Travels in one direction at a constant speed of only 50 RPM. As many as five threaded parts can be rolled DURING EACH REVOLUTION. Ends costly "lost motion" and "lost time."



..... Prutton Planetary Die System

Prutton
CORPORATION
5295 WEST 130th STREET
CLEVELAND 30, OHIO

Start a cost cutting program now with a Prutton—for thread rolling, roll forming, knurling, serrating and necking of nails, bolts, screws and special parts in a wide range of sizes.

Send prints and/or samples for estimates on machine costs.

. . . Leader in Planetary Thread Rolling Machines

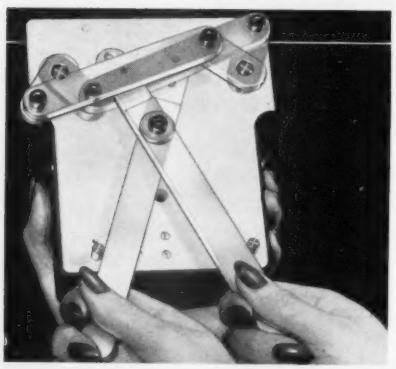
Cutting head is exceptionally lightweight, fabricated of cast aluminum, and weighs only 6 1/2 lbs. Cutting blades are designed for ease of replacement. Cutting capacity is 7/16 mild steel. The complete Manco cutter is powered by a 110-volt 3/4 HP Motor; hydraulic valve control utilizes new S-4 solenoid valve. Weight of the entire mobile power unit is 65 lbs.

* * *

Among the many uses for the new Manco portable cutter are: cutting metal samples in wire and rod mills, trimming rod and wire, and cutting reinforcing mesh in general construction work. For complete information, write Manco Mfg. Co., Bradley, Illinois.

New Compound Lever Facilitates Insertion of Tension Meter in Moving Wires, Cords or Cables

Tensitron, Inc., P.O. Box 185, Harvard, Mass., makers of a complete line of Tension Meters and Controllers, has introduced an ingenious mechanism that permits quick and automatic tension measurement of any filamentous material. The phantom view of the new



instrument shows the two outer reference rollers as lifted by moving the long hand-lever to one side. This separates the rollers, and the material to be tested is then placed in position. When the long lever is moved, the spring-restrained center roller (not shown in this back view) is depressed by the wire in relation to the wire tension. This deflection is mechanically amplified, assuring significant rotation of the indicating pointer, even for a small angular change of the sensing arm. The

compound lever action makes the insertion of a fast-moving wire into the 3 roller system simple under reliable and reproducible conditions. It allows sustained accuracy independent of the operator, and does so safely. The operator's fingers are protected from slipping into the path of the running wire by recesses in the mounting plate. The lever is operated from the offside, permitting safe positioning while the wire moves. The dial can be observed simultaneously without danger to the operator. Further details available upon request.

Literature on Wood Products

American Wood Working Co., Box 335-W, Montello, Wisconsin, has issued a chart on the properties of different woods and the products to which they are suited. In addition a reprint of an article, "How Many Things Can You Make of Wood", also is available.

* * *

Long known as a manufacturer of wood reels and spools for the wire and cable industry, the company in addition makes to order any type of wood product, many of which find applications in the wire and wire product fabricating industry. Products made involve a large variety of woods, each selected for its suitability for a particular product.

* * *

The company will be glad to mail copies of the above literature to interested persons and invites inquiries on any wood needs — reels, spools or other items.

Selas Moves Cleveland Office

Frederic O. Hess, president, **Selas Corporation of America,** Dresher, Pa., announces that the company's Cleveland Sales District Headquarters has been moved to 6025 Mayfield Road, Cleveland 24, Ohio. The telephone number for the new District Office, headed by **T. G. Thurston,** is Hillcrest 2-6655.

The 1961 BUYERS' GUIDE
Have you ordered your copy?
Price: $5.00

For Moisture Resistance, Specify

TEXTILENE

TWI-FLEX and TWI-WAX

Treated to reduce wicking and prevent leaching, lightly waxed Textilene Twi-Flex and heavily waxed Textilene Twi-Wax provide effective resistance to moisture. Both fillers are extensively employed for non-metallic sheathed cable (building wire), maritime shipboard cable, varnished cambric cable, and underground service entrance cable.

Twitchell's superior Textilene line also includes: Soft, dry fillers — *Twi-Port* and *Glascor** (Fiberglas-centered for high tensile strength without added bulk). Used for control, power, appliance, coaxial and communications cables, and all portable and flexible cords. Fungus-resistant filler — *Twi-Tar*. Used for buried communications cable, expanded ACSR cable, and in other applications.

*Patent Applied For

For Every Wire and Cable Application
Twitchell's TEXTILENE Fillers Fill The Bill

Quality-controlled materials that are dependably uniform . . . in standard forms, or customized to special needs.

Initial low cost with savings added by production efficiency . . . flexible, ready-to-use fillers that fit all equipment, handle and form easily, always maintain desired shape.

Assured supply from a reliable domestic source . . . always available in economical and convenient packaging.

Proved performance as components of cables and wires that meet government specifications . . . stability shown by trouble-free installations in continuous service 20 years and longer.

FREE — SAMPLE SPOOLS of any type of Textilene filler to demonstrate the superiority of Twitchell materials in your operation — also technical counsel without cost or obligation. Just tell Twitchell your end-use requirements. *Write, wire, or phone today:*

E.W. TWITCHELL INC.

Third and Somerset Streets, Philadelphia 33, Pa. • REgent 9-7800

PAPER PRODUCTS FOR THE WIRE INDUSTRY

Twisted • Folded • Pressed • Crushed • Shaped • Braided • Woven

Outstanding Personalities of the Wire Industry

Ken Beardslee To Retire

Kenneth R. Beardslee will retire April 1 as Consultant to the **Metallurgical Products Department** of **General Electric Company**, Detroit. He has been in the organization nearly 31 years.

* * *

Mr. Beardslee joined the Carboloy organization in 1930 as a sales engineer. In 1933 he was made district manager in Pittsburgh — in the worst part of the great depression. The whole nation was sunk in despair, but he refused to be licked. He and his staff proceeded to break sales records. With an abiding faith in Carboloy and Carboloy Carbides, he had a determination to get them recognized in his territory. As a starter he went after the wire die business, and proved the value of his product. Wire mills found it profitable to replace cast iron dies costing a nickel each with carbide dies at $23.80 each. In 1936, the Carboloy home office decided it needed some of his magic, and made him General Sales Manager. Working with the late **W. G. Robbins**, then President, he is given high credit for giving Carboloy a new lease on life in an extremely critical period.

* * *

After developing the wire die business, he moved on to other products. Recognizing the need to train users in design and application of cemented carbides, he organized the Department's first customer training course. In 1940 he began development of the Carboloy chain of distributors to provide better service to customers. This chain now has grown to 157, with warehouse facilities in all major industrial centers.

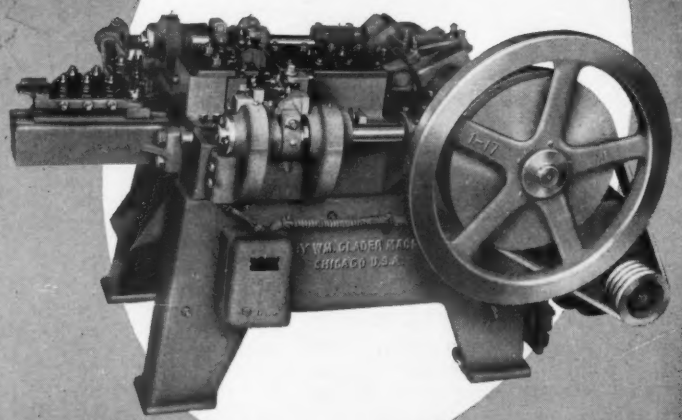
Kenneth R. Beardslee

* * *

In 1943 the office of Vice President in charge of sales was created and he was the logical choice. In a consolidation of Merchandising, Sales, Business Services and Training in 1948, he was named Vice President and Marketing Manager. In July 1950, after the death of Mr. Robbins, Mr. Beardslee was advanced to the presidency of the Carboloy Co. He became General Manager in 1951 when the organization was changed from an affiliate to a department of General Electric Company. Not long afterward, in 1951, he built the plant at

high efficiency — low cost
with GLADER wire nail machines

Eliminate costly down-time in the Nail Mill by replacing obsolete machines with new GLADER NAIL MACHINES . . . For tops in efficiency and economical operation use GLADERS.



WM. GLADER
MACHINE WORKS
210 N. RACINE AVENUE • CHICAGO 7, ILLINOIS

EXPORT DEPT., 122 EAST 42ND STREET, NEW YORK 17, N. Y.

Edmore, Michigan for fabricating Carboloy Cemented Carbides. Alnico magnets and Thermistors and Thyrites were added in 1952. He was made Consultant to the Department early in 1959. Mr. Beardslee has been a member of The Wire Association for many years.

C. F. & I. Appointments

C. C. Tappero, Superintendent of **The Colorado Fuel & Iron Corporation's** Pueblo Wire Mills, has announced three appointments.

* * *

Robert P. Hannigan, General Foreman since 1954, has been made Assistant Superintendent; **John E. Murphy,** formerly General Foreman of the Barb Wire Shop, has been named General Foreman, Wire Mills; and **Gene Kohler,** who had been Foreman of the Cleaning House, has been appointed General Foreman of the Wire Mill Drawing Room.

* * *

Mr. Hannigan attended Colorado State University, Mr. Murphy graduated from Colorado University, and Mr. Kohler holds a degree in business administration from Colorado College.

Kenrich Buys Laribee Wire and Equipment

Oscar A. Spiegelhalder, president of Kenrich Petrochemicals, Inc., has announced that, as of December 31, 1960, the wire manufacturing business of **Laribee Wire & Equipment Corp.,** Camden, N. Y., has been acquired by his company, and will be operated as a subsidiary under the name **Laribee Wire, Inc. Wilbur Liddy,** formerly with the Laribee firm has been elected president of the new corporation. As copper wire fabricators the new firm will continue the production of bare and tinned wire and such items as braided cable, bunched and stranded conductors, and other types of constructions.

Wilbur Liddy

* * *

Mr. Liddy has had seven years of experience as Vice President in Charge of Production and Sales and will head a planned expansion program for the company. Prior to his joining Laribee Wire and Equipment Corp., he was New England Divisional Sales Manager for the De Laval Separator Company.

To Sell Silicone Products

K. J. Morray has been named sales manager of the **Silicone Products Department** of the **Gen-**

WIRE MARKING INKS

- WILL PASS ALL PRESENT DAY ABRASION AND SOLVENT RESISTANT TESTS
- SPECIFICALLY COMPOUNDED FOR DIFFERENT INSULATIONS
  - POLY VINYL CHLORIDE
  - RUBBER, NATURAL OR SYNTHETIC
  - NYLON
  - POLYETHYLENE
  - SILICONE
- FOR PRINTING OR SPIRAL STRIPING
- DATED FOR SHELF LIFE AND INVENTORY CONTROL
- FOR HOT OR COLD APPLICATIONS
- ALL COLORS AVAILABLE (SPECIAL SHADES MADE TO ORDER)
- SAME DAY SERVICE
- FOR GRAVURE OR OFFSET MARKING

GEM GRAVURE CO., INC.
West Hanover, Massachusetts, U. S. A.
CABLE ADDRESS: GEMGRA
Telephone: ROCKLAND TRiangle 8-0456

IN THE MARKING OF EXTRUDED MATERIAL THERE ARE BIG ADVANTAGES IN ONE SINGLE SOURCE OF SUPPLY.

KNOW-HOW • INKS • WHEELS • MACHINES

West Coast Representative: Paul I. Kenner Co., 230 Shaw Rd., So. San Francisco, Calif.
West Germany: Walter G. Fritzke GMBH, AM Wehrhahn 94-96, Dusseldorf, W. Germany
Warbrick Engineering Specialties Limited, Barclays Bank Chambers, Sanky Street, Warrington, England.

eral Electric Company, Waterford, N. Y. He succeeds **Thomas J. March** who has taken a new post as manager of sales operations of G-E's newly-established Internal Automation Operation in Schenectady.

* * *

Mr. Morray's office will be located in Waterford, headquarters for sales, manufacturing and research for General Electric silicones. In his new post, he will be responsible for fourteen sales offices throughout the U. S. He holds a Bachelor of Science degree in Chemistry from the University of Chicago and joined General Electric in 1949.

Firth Sterling Appointments

Firth Sterling Inc. has announced the promotion in the carbide division of **Dr. C. H. Toensing,** director, powder metals research, following the resignation of **J. C. Redmond.** Prior to joining Firth Sterling 18 months ago as manager, powder metals research, for eight years he was a research and development engineer in the lamp metals and components department of General Electric Company.

* * *

Melvin A. Jones has been appointed superintendent, fabrication, following the resignation of **E. W. Coleman.** He joined Firth Sterling 10 years ago and most recently served as chief industrial engineer.

* * *

Blaine R. Helmer succeeds Mr. Jones as chief industrial engineer. Mr. Helmer has been with the company for 10 years and previous to this appointment served in several management positions.

* * *

Kenneth E. McKown has been promoted to Pittsburgh district manager, carbide division, succeeding the late **Norman E. Donnelly.** Mr. McKown joined Firth Sterling 18 years ago and has served in production and sales capacities. Previously he was a sales representative in the Buffalo area.

* * *

Philip L. Zanello has been named carbide sales engineer in the Pittsburgh district office. He will cover the Buffalo-Rochester areas of New York state. He had served in sales capacities for 10 years in this same area before joining Firth Sterling.

Wheelabrator Forms Canadian Company

Formation of a new Canadian company, **Wheelabrator Corporation of Canada, Ltd.,** has been announced by **James F. Connaughton,** chairman of the board.

* * *

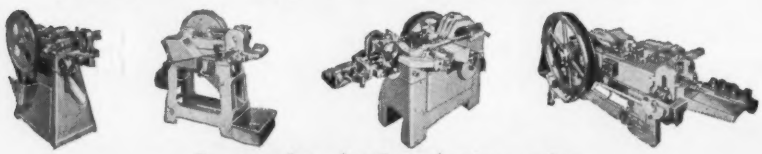
The new corporation is the successor to the Canadian Division of Wheelabrator Corporation of Mishawaka, Indiana, and was organized to handle expanding sales and fabricating activities for all provinces in Canada.

* * *

Harold M. Miller is president and **Robert A. Campbell** is vice president and general manager and is in charge of Canadian operations. **J. D. Lamb** is general sales manager. Other officers are **Jacob A. Schmidt, Jr.,** vice president, **Edward T. Sullivan,** secretary and treasurer; and **James E. Donlan,** controller. Wheelabrator is a subsidiary of Bell Intercontinental Corporation.

The new Morris-Omega "00" SDDS Cold Header forms parts from wire down to .012" diameter in lengths as short as .016" — and at production rates as high as 150 per minute!

The Model "00" is only one of a series of precision heading machines, which includes a special open die type that will head parts up to 2⅜" in length on wire sizes from .020" to .090".



For complete details and prices, write:

REM SALES INCORPORATED

SUBSIDIARY OF THE ROBERT E. MORRIS COMPANY

5018 FARMINGTON AVENUE • WEST HARTFORD 7, CONN.

Simmons Advanced by Hudson Wire

Robert M. Akin, Jr., Chairman-of-the-Board of **Hudson Wire Company,** announced that effective January 13, 1961, **James T. Simmons** was named Vice President-Operations.

* * *

Mr. Simmons will have direct responsibility for Sales, Engineering, and Manufacturing of all Hudson Divisions, including plants in Ossining, New York; Winsted and Norwalk, Connecticut; and Cassopolis, Michigan.

* * *

The Ossining Division specializes in bare, plated and stranded specialty wires for the insulated wire and cable manufacturing industry, and for mechanical applications. The Winsted and Cassopolis Divisions produce a wide variety of magnet wires for electrical and electronic applications. The Pequot Division in Norwalk, Connecticut, manufactures industrial wire cloth in rolls and fabricated parts.

James T. Simmons

* * *

For the past 9 months, Mr. Simmons has been General Manager of Hudson's Ossining Division. During this time, Mr. Simmons was responsible for a number of improvements in products, packaging and manufacturing. He joined Hudson Wire Company in June, 1959 as Plant Manager for the Ossining Division. Earlier, he had been Supervisor of Manufacturing Methods at General Electric's Wire and Cable facilities in Lowell, Mass., and a Management Engineer with Bigelow, Kent, Willard & Company of Boston and New York.

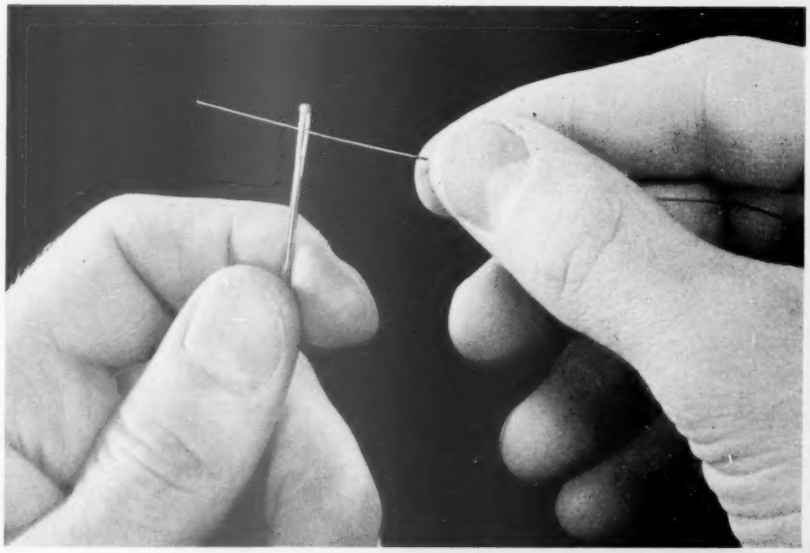
Union Carbide Plastics Company Names Assistant Director — Development

Philip A. Thomas has been promoted to Assistant Director — Development for **Union Carbide Plastics Company.** According to the announcement by Dr. R. F. Clash, Director — Development, Mr. Thomas will co-ordinate the Company's development activities at Bound Brook, N. J., on Bakelite brand polyethylene, vinyl, phenolic, polystyrene, and epoxy resins, as they relate to the molding, bonding and laminating fields.

* * *

Mr. Thomas was graduated from Lehigh University in 1943 with a Bachelor of Science degree in Chemical Engineering. He joined Union Carbide Plastics Company in 1946.

ALLOY WIRE:
Tailor-made for Specific Purposes



Precision Drawn **Strand Annealed** Wire

THESE BASIC ADVANTAGES ARE BIG ONES:—

- Closer in tolerances than most commercial wires
- Make important savings in finished products possible
- Tailor-made with special characteristics to meet specific needs

Drawing specialty wire to consistent fine tolerances with specific characteristics of tensile, elasticity, hardness, grain size, etc., demands *exacting control* through all production phases. When applied to specific requirements, these "Specials" also require extensive know-how and advanced production facilities.

As a leading producer of finest quality paper mill wire cloth, woven mesh and cold drawn wire, our production team of metallurgists, engineers and technicians can help you select the right wires for any application and deliver them "on schedule."

WISCONSIN WIRE WORKS
APPLETON · WISCONSIN

Beryllium Corp. Appoints P.A.

The Beryllium Corporation has announced the appointment of **Theodore R. Blessing** to the position of general purchasing agent. In this new position, he will be responsible for the purchasing policies and buying functions of the corporation and its divisions.

* * *

At the same time, it was announced that **Robert L. Krize,** has been advanced to the position of assistant purchasing agent. A former buyer in the company's purchasing department at Reading, he will assume his duties at the corporation's Nuclear Division in Hazleton, Pa.

Marshall Succeeds Davies At Driver-Harris

William A. Marshall has been appointed assistant vice president and manager of manufacturing at **Driver-Harris Company**, manufacturer of electrical alloys. He succeeds **Edward J. Davies,** who has retired.

* * *

Mr. Marshall joined Driver-Harris in 1954, as an industrial engineer, and later served as assistant manager of manufacturing under Mr. Davies.

* * *

A graduate of Yale University, he received his Bachelor of Science degree in mechanical engineering in 1946. Prior to joining Driver-Harris, he was associated with **New Jersey Zinc Co.** and **Rome Cable Corp.**

William A. Marshall

During World War II he served in the Navy, and reentered the service at the time of the Korean War, serving as communications and operations officer. He is a member of The Wire Association and the Society For Advancement of Management.

Gibbs Joins Electron-Machine

Charles D. Gibbs recently joined **The Electron-Machine Corporation** of Umatilla, Florida, where he heads a new organization for the world-wide marketing of the company's industrial electronic measuring and process control equipment.

* * *

For the past fourteen years, Electron-Machine has devoted its efforts to development of process measurement and control circuitry, licensing the production and sales to other companies. In conjunction with the decision to enter the fields of manufacturing and marketing, the company occupied a new 10,000 square foot building last September.

* * *

Electron-Machine has available

HOW TO CUT HIGH MAINTENANCE COSTS . . . SPEED CUTTING OPERATIONS

From rod and wire mills everywhere come reports that down-time for repairs is practically non-existent with the Porter Hydraulic. Add to this — *faster* cutting, and you have these vital ingredients for boosting your production. Two features found *only* in Porter Cutters make this efficiency possible.

CUTTER BLADES WITH
• MORE BEARING SURFACES
.... WON'T BREAK DOWN!

Because blades are longer they have more bearing surfaces for *rigid* alignment, thus eliminating any side thrust which causes breakage.

Filtered air taken into the cylinder is forced out around the movable blade on each cut, eliminates danger of dirt reaching bearing surfaces causing oil leakage and wear.

PORTER HKP®

ROD & BAR CUTTER

A HYDRAULIC SYSTEM OF FOOL-PROOF DESIGN! One-hose design cuts replacement costs in half. Adjustable relief valve saves wear and tear by providing the correct pressure for any cutting job. Hydraulic oil is filtered by an easy-to-change 40 micron oil filter. And a safe 12-volt control switch on the cutterhead gives instant finger-tip control of the cutting action.

WRITE FOR ON-THE-JOB DEMONSTRATION OR ROD AND BAR CUTTER CATALOG

AVAILABLE NOW! 3 CUTTERHEADS with capacities up to 1⅜" steel rods. 5 HYDRAULIC POWER UNITS. Matched to your exact requirements. Specially designed heads for other non-cutting applications, such as punching, crimping, heading, forming.

H. K. PORTER, INC.,
Somerville 43, Mass.

and in design a comprehensive line of electronic measurement and control equipment for the electric wire and cable industry, including diameter gages, concentricity gages, automatic controls and continuity checkers. Other long-needed specialized equipment for the wire and cable industry is in development.

* * *

The company's other products include industrial process data compilation and computation systems for use in production control and cost accounting, multi-input process control systems, special purpose photoelectric gages and high-speed classifying equipment.

* * *

Mr. Gibbs was formerly associated with **Industrial Gauges Corporation,** Englewood, N. J., and its successor, **Daystrom, Inc.** where he held the position of market sales manager for their photoelectric diameter gaging equipment.

GE Makes Research Appointment

David W. Lillie has been named manager of the Materials Application and Evaluation Section of the **General Electric Research Laboratory,** Schenectady, N. Y., it has been announced by **Dr. Walter R. Hibbard, Jr.,** manager of the Metallurgy and Ceramics Research Department.

* * *

Mr. Lillie received his bachelor's degree from Harvard University and later pursued graduate studies at the Stevens Institute of Technology and the Massachusetts Institute of Technology. Before joining the General Electric Research Laboratory in 1954, he was a member of the staff of the Crucible Steel Company of America, the Massachusetts Institute of Technology, and the U. S. Atomic Energy Commission, where he was chief of the metallurgy branch of the division of research. A specialist in nuclear metallurgy and refractory metals, he is the author of a number of scientific papers.

* * *

He succeeds **Dr. James H. Keeler,** who has been appointed manager of engineering in the engineering section of the Company's Lamp Metals and Components Department in Cleveland, Ohio.

Flexible Tubing Appoints Sales Manager

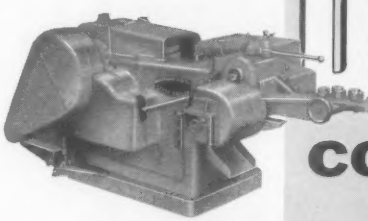
The appointment of **H. John Asma** to be Regional Sales Manager, Technical Products, for **Flexible Tubring Corp.** has been announced by **Frederick K. Daggett,** president. Mr. Asma will make his headquarters at the company's plant in Hillside, Illinois.

* * *

Prior to joining Flexible, Mr. Asma was sales manager of the International Coupling Division of the Gabriel Company in Cleveland, Ohio. He is a graduate of Niagara University with a degree of Bachelor of Science in Business Administration.

Available NOW—

FAMOUS GREENBAT COLD FORGING MACHINES



HS TYPE
SOLID DIE

for **VERSATILITY • SPEED • ACCURACY AND ECONOMY**

Welcome news to plants with cold and hot heading requirements . . . the internationally known Greenwood & Batley, Ltd's Greenbat line of high-speed heading machinery is now available through Unitech Products, Inc.

The high-quality, precisely engineered Greenbat line comprises single, double, and triple stroke machines, and in the design of each model particular attention has been given to ease of maintenance, tool setting, and complete tool interchangeability with machines of different make. Every Greenbat is furnished motorized, and can be supplied with American threads if desired.

Take advantage of Greenbat's low investment requirement, economy of operation, and outstanding performance efficiency. Investigate now by writing for complete data on your specific needs.

GREENBAT SALES DIVISION

UNITECH *Products, Inc.*

10 RAILROAD AVENUE • HARTFORD, CONN.

Burghoff Succeeds Crampton At Chase Brass

The appointment of **Henry L. Burghoff** as Director of Research and Development for **Chase Brass & Copper Co.,** has been announced by **G. P. Bakken,** president of the firm. Dr. Burghoff succeeds **Dr. D. K. Crampton** who is retiring after more than 44 years of service.

* * *

Dr. Burghoff joined Chase as a research metallurgist immediately following his graduation from Yale University, where he received his B.S. degree in 1928. While employed in the company's Technical Department, he continued his studies, receiving his M.S. degree in 1930 and Doctor of Engineering in 1939. When the Chase Research and Development Department was organized in 1952 he was made Assistant Director.

* * *

Dr. Crampton, who retired on February 1, also is a graduate of Yale from which he received his Ph.D. degree. He started with Chase as a laboratory assistant in 1916 and had been Director of Research since 1921.

Changes at Triangle Conduit

Key executive organizational changes of the **Triangle Conduit & Cable Co., Inc.,** New Brunswick, N. J. have been announced by **Carl S. Menger,** President. Assuming new positions are **Jack M. Slater,** who has been elevated to Vice President and Treasurer; **Edward J. Simmons,** Vice President-Sales in addition to his present position of Assistant Secretary; **John E. McAuliffe, Jr.,** Assistant to the President while continuing in his present role as Secretary; **Bruce A. Johnson,** Assistant Director of Purchases; and **William E. Bowlby,** Administrative Assistant to the Director of Sales-Brass and Copper Tube Division.

Cleveland Metal Abrasive Increases Coverage

Simultaneous with the announcement of completing its Cleveland plant expansion program, **The Cleveland Metal Abrasive Co.,** manufacturer of iron and steel shot and grit, named **John J. Zook,** National Service Manager, and **Schuyler Livingston,** Regional Sales Engineer. The announcement was made by **Ray Stewart,** President.

* * *

Mr. Zook joins the organization after 19 years as Steel Works Metallurgist at Jones & Laughlin, Cleveland, and two years as Development Metallurgist at Lone Star Steel, Dallas, Texas.

* * *

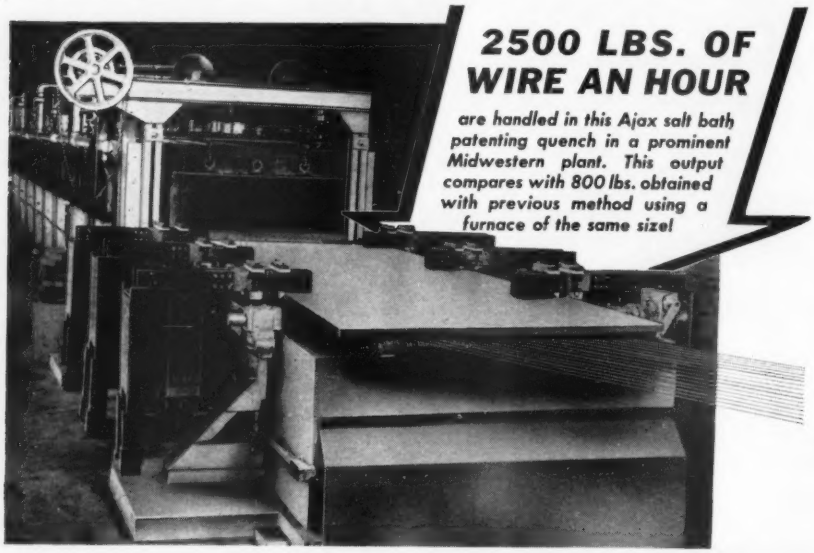
Mr. Livingston's appointment as a Regional Sales Engineer comes after working in a similar capacity with Minnesota Mining & Manufacturing, National Bracket and Wheelabrator.

To Head Engineering for National Aniline

The appointment of **Raymond C. Baxter** as Vice President-Engineering for **Allied Chemical's National Aniline Division** has been announced by **James G. Fox, Jr.,** Division President.

* * *

In this newly-created position,


2500 LBS. OF WIRE AN HOUR
are handled in this Ajax salt bath patenting quench in a prominent Midwestern plant. This output compares with 800 lbs. obtained with previous method using a furnace of the same size!

Here's maximum speed, accuracy and economy in Wire Patenting!

No other method offers so many possibilities for quality improvement and cost reduction in the patenting of high- and medium-carbon steel wire or rods. Automatic temperature control—an inherent result of Ajax internally-heated salt bath furnace design—provides continuous accuracy within ±5° F. throughout the bath. You are thus assured of the uniformity so vital to obtaining proper tensile strength and grain structure.

More poundage can be handled. Savings up to 30% in pickling time are common. Salt residue is easily removed by a water wash. The entire patenting process lends itself readily to inexpensive automation. Maintenance is negligible. Long-life, immersed-type electrodes can be changed in an hour or two—without tearing down furnace or pot. Pots last indefinitely.

AJAX
HULTGREN
SALT BATH FURNACES
Internally heated electric and gas-fired types

WRITE FOR AJAX CASE HISTORY BULLETINS ON: ☐ Patenting; ☐ Process Annealing; ☐ Descaling; ☐ Cleaning, Preheating, Fluxing.

AJAX ELECTRIC COMPANY 928 Frankford Ave., Philadelphia 23, Pa.

Mr. Baxter will be responsible for all National Aniline engineering and construction activities.

* * *

Mr. Baxter joined Allied Chemical in 1946 as a Process Engineer with the Solvay Process Division in Syracuse, N. Y. He was appointed Assistant Chief Engineer in 1954 and Chief Engineer in 1957. Two years later, in 1959, he was promoted to Assistant Director of Operations. He holds a Bachelor's degree in Chemical Engineering from Cornell University in 1944.

Chase Names Marketing Manager

The appointment of **David S. Soliday, Jr.** as Marketing Manager-Warehouse Division has been announced by **Chase Brass & Copper Co., Inc.**, a subsidiary of Kennecott Copper Corporation.

Kaiser Promotes Fenton

D. W. Fenton, Kaiser Aluminum & Chemical Sales, Inc., has been named manager of wire sales in the Rod, Bar and Wire Markets Sales Department reporting to **W. J. Lawler,** department manager.

* * *

Mr. Fenton has been with Kaiser Aluminum for six years. He transfers to the company's Oakland, Calif., headquarters from Toledo, Ohio, where he had been branch manager.

Armco Names Boston Office Supervisor

Edward L. Kelly has been named supervising salesman of the Boston sales office of the Armco Division, **Armco Steel Corporation, Murray B. Wilson,** vice president-sales, Armco Division, has announced.

* * *

The Boston office is the New England area sales contact for the division's carbon and stainless steel products.

* * *

Mr. Kelly, who was formerly a salesman in Armco's Boston office, has succeeded **Frank R. Wright,** who has retired. Kelly joined Armco in 1945 as a service engineer. He subsequently became a salesman in the New York office and later was transferred to Boston.

* * *

He joined Armco in 1941, worked in purchasing at the Baltimore Works and then became a salesman and field engineer in Armco's Buffalo office. He has been supervising salesman of the Boston office since 1954.

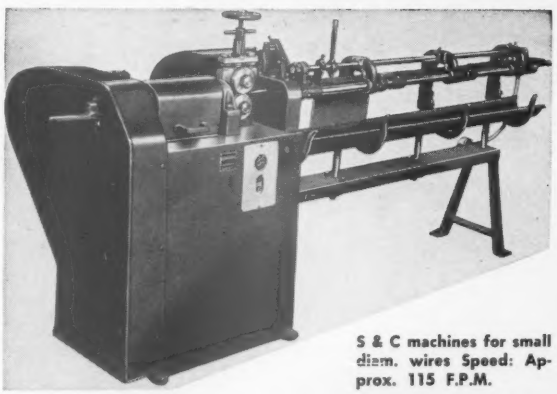
SKF Names Production Manager

Appointment of **James R. Miller** to the post of production manager has been announced by **Karl Kesselring,** vice president of production, **SKF Industries, Inc.,** He succeeds **J. A. Graham,** who joined Bearings Company of America.

* * *

In his new post with the major ball and roller bearing manufacturer, Miller will be responsible for development and maintenance of production planning and control activities, along with adding the corporate responsibility for inventory planning.

New! Improved! Fast!
WELLS STRAIGHTENER & CUTTER



S & C machines for small diam. wires Speed: Approx. 115 F.P.M.

This completely redesigned line combines maximum efficiency with that rugged dependability, for which WELLS S&C machines have become justly famous.

Built in several sizes to handle 2 to 18 ga. basic and high carbon wire.

FEATURES

The guide bar of these new machines can be supplied for any cut lengths • The rotary flier runs on ball bearings for smoothness and long life • Cut-off is actuated by a solenoid for extreme accuracy of cut lengths • A two point cam construction provides a quick and positive return of the cut-off knife, eliminating the need for a clutch and dog • A counter is standard equipment.

A COMPLETE RANGE OF S & C MACHINES IS MADE BY WELLS FOR ALL SIZES OF WIRE. SEND FOR CATALOG ON THE COMPLETE LINE.

Frank L. Wells Company

Builders of Fine Wire Working Machinery

5821 FIFTH AVENUE • KENOSHA, WISCONSIN

Wheelabrator Brochure Describes Overseas Sales and Service

"Wheelabrator Worldwide" is the title of a new 16-page brochure that pictorially describes the export facilities and worldwide operations **Wheelabrator Corporation** has developed to meet the growing needs of industry for metal cleaning and finishing equipment and dust and fume control equipment.

* * *

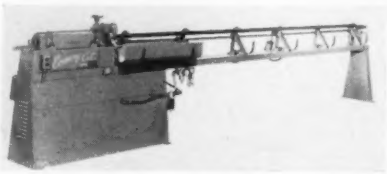
This brochure will be especially helpful to U. S. manufacturers with overseas operations because it describes distinctive Wheelabrator services and equipment designed to assist such manufacturers in setting up effective and economical metal cleaning or finishing departments, and in providing for efficient dust and fume control.

* * *

Write to Wheelabrator Corp., 1184 S. Bykrit St., Mishawaka, Ind., a subsidiary of Bell Intercontinental Corp., for a copy of the brochure.

New S & C Machine Announced

A new automatic Straightening and Cutting Machine has been announced by **W. V. Industries Div. of Vermaline Products Co.**, Franklin Lakes, N. J.



Model WS 60 Machine

Features of this machine, Model WS 60, are:

1. **Handles 1/32″ to 1/4″ diameter wire.**
2. **Cuts lengths from 1/4″ to 12′.**
3. **Operating economy due to unique air cut-off system.**
4. **Four speeds — 85′ to 175′ per minute.**
5. **Simple racking and discharging chute.**
6. **Rugged construction for maximum performance.**

* * *

The machine sells for $4500.00 F.O.B. plant. Full details may be secured from the manufacturer.

Pangborn Bulletin on Blast Cleaning Barrels

Exclusive features found in Pangborn's standard-duty line of blast cleaning barrels is described in Bulletin No. 706. This 16-page booklet is directed to manufacturers of castings, forgings, weldments, plastics, and to auto-parts reconditioners. It is well illustrated with diagrams and photographs, and contains brief specifications and dimensions of each of the five sizes ranging in capacity from 1½ to 18 cubic feet.

* * *

A number of case histories are outlined to show how many companies have realized substantial profits by using either standard or automated Rotoblast units. Outstanding features of the abrasive impeller, heart of each Rotoblast unit, are described and illustrated.

* * *

Copies of Bulletin No. 706 may

(ILLUSTRATED)
42″ x 20″ x 21″—(4000# cap.)

Heavy Duty

BREAK-DOWN REELS

1000#
2000#
4000#
} capacities

Rugged Design including patented DURA-CURL rim, and many other features necessary to provide the *Strength* and *Durability* needed for continued successful performance.

Also complete line of sizes of Modern High Speed Wire Drawing NO-CREV Spools and Reels for both fine and intermediate size wire.

Mossberg PRESSED STEEL Corporation
"Division of Wanskuck Co."
18 WEST ST., ATTLEBORO, MASS., U.S.A.

Telephone
CAstle 2-0847

#103

be obtained by writing Pangborn Corporation, Hagerstown, Md.

Monsanto Ups Capacity

Monsanto Chemical Company's Plastics Division is increasing by 30 per cent the capacity of its high-pressure polyethylene plant in Texas City, Texas.

* * *

F. E. Reese, assistant general manager of the division, said that work on the expansion has begun and that the final stage is scheduled for completion early in 1962.

* * *

Technological refinements incorporated in the new facilities will permit the manufacture of larger quantatives of recently introduced polyethylene resins especially designed to meet process and performance requirements of specific markets.

Firth Sterling Modernization Program

The Board of Directors of **Firth Sterling Inc.** has approved a substantial capital expenditure program for the purpose of modernization and cost reduction. These projects include a continuous, controlled atmosphere, annealing furnace which will further improve the quality of product, particularly high speed steel. In addition, a new 18″ cogging mill will be installed and at the same time the 12″ mill will be renovated. To complete the program in the Steel Division, one 10″ rolling mill will be modified so that both 10″ mills can produce similar rolled products, providing greater flexibility in scheduling, thus making possible quicker deliveries.

* * *

Substantial additions are likewise being made to tungsten powder producing facilities in the Carbide Division, necessitated by a two-year contract calling for the delivery of more than one million pounds of tungsten carbide powder to the Supplemental Stockpile, and to provide additional capacity in anticipation of substantial bullet core procurement on the part of the Ordnance Department, U. S. Army.

Welding Show To Be in New York

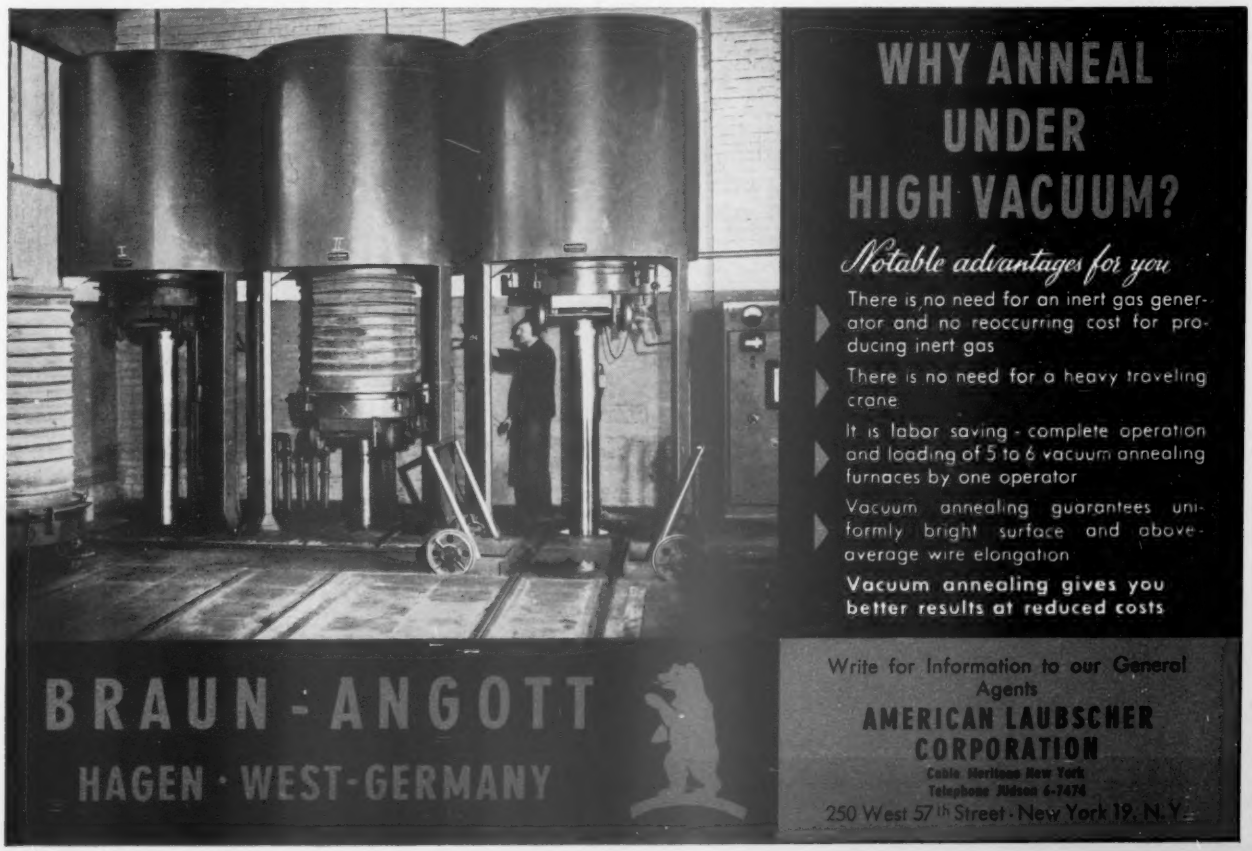
The American Welding Society announces that practically 90% of all available space has been sold for its Annual Welding Exposition, which will be held April 18-20, 1961, in the Coliseum, New York.

* * *

The Welding Show is one of the most highly specialized industrial shows in the United States. Only manufacturers of welding equipment, materials, and the like, or products closely related to welding, are permitted to exhibit. Attendance is similiarly restricted to those with a primary interest in the welding field.

* * *

A Technical Meeting will be held concurrently, April 17-21, at the Commodore Hotel, New York. The American Welding Society will sponsor 22 technical sessions consisting of 65 papers.


WHY ANNEAL UNDER HIGH VACUUM?
Notable advantages for you
There is no need for an inert gas generator and no reoccurring cost for producing inert gas
There is no need for a heavy traveling crane
It is labor saving - complete operation and loading of 5 to 6 vacuum annealing furnaces by one operator
Vacuum annealing guarantees uniformly bright surface and above-average wire elongation
Vacuum annealing gives you better results at reduced costs
BRAUN-ANGOTT
HAGEN · WEST-GERMANY
Write for Information to our General Agents
AMERICAN LAUBSCHER CORPORATION
Cable Meritoss New York
Telephone Judson 6-7474
250 West 57th Street · New York 19, N. Y.

A Review of Recent Wire Patents

The data listed below is only a brief review of recent patents pertinent to the readers and subscribers of this publication.

Complete copies of these patents may be obtained by writing to the publisher of this magazine and remitting 50¢ for each copy desired. For orders received from outside the United States the cost will be $1.00 per copy.

No. 2,967,390, APPARATUS FOR MAKING FLEXIBLE SPIRAL WOUND WIRE HOSE, patented January 10, 1961 by Clarence E. McCormick, Poland, Ohio, assignor to Lee Rubber & Tire Corporation, Youngstown, Ohio, a corporation of New York.

Thirteen claims in this patent for apparatus for incorporating, in high pressure flexible hose, oppositely disposed layers of spirally wound wires, while the hose is rotating on its longitudinal axis.

* * *

No. 2,967,391, WIRE CABLE SLING AND METHOD OF FABRICATING SAME, patented January 10, 1961 by Afton A. Himick, Allen Park, Robert J. Billinghurst, Livonia, and Albert A. Haddock, Detroit, Mich., assignors to Industrial Cable & Sling Company, Detroit, Mich., a corporation of Michigan.

A wire cable sling is provided, constructed of a number of wire strands twisted together to form two eyes joined by an intermediate straight portion. * * *

No. 2,968,052, INTERLOCKED SPRING ASSEMBLY FOR PADDED BOX SPRINGS, patented January 17, 1961 by Joseph F. Ciampa, Medford, Mass., assignor to Standard Box Spring Company, Boston, Mass, a corporation of Massachusetts.

It is stated that the principal purpose of the invention is to reinforce the outer convolutions of conventional wire coil springs with interlocking wires extending both longitudinally and transversely of the assembly to provide adequate rigidity with desired resiliency, among other desired objects of the invention.

* * *

No. 2,968,234, APPARATUS FOR LOOPING FLEXIBLE BINDING MATERIAL AROUND PACKAGES AND THE LIKE, patented January 17, 1961 by Frederick William Mosey, Oswald Victor Langford, and Jack Wild, London, England, assignors to Seal-Less Strapping, Limited, London, England, a corporation of Great Britian.

For looping wire or metal straps about a package, the inventor provides apparatus including a looping guideway open toward one end and defining a shelf sufficiently wide to receive and independently support the wire or strap while permitting free movement of the wire or strap toward the open side, with means adjacent the side at one end of the looping guideway for urging the material into the shelf and away from the open side of the guideway.

* * *

No. 2,968,418, WIRE MILK CRATE, patented January 17, 1961 by Craig Stoddard, 2031 Elmwood Ave., Wilmette, Ill.

The crate is constructed of wire, as to sides, ends, bottom and spacing means for the vertical side and end wires.

* * *

No. 2,968,451, CONTROL FOR AN UNCOILER, patented January 17, 1961 by Edward J. Schneider, Pittsburgh, Pa., assignor to the United States Steel Corporation, a corporation of New Jersey.

More specifically, the control is for slowing down the speed at which material, as wire, is pulled from an uncoiler.

* * *

No. 2,968,863, PROCESS OF MAKING PIANO STRING, patented January 24, 1961 by Robert E. Johnson, 2011 Clybourn Ave., Chicago, Ill.

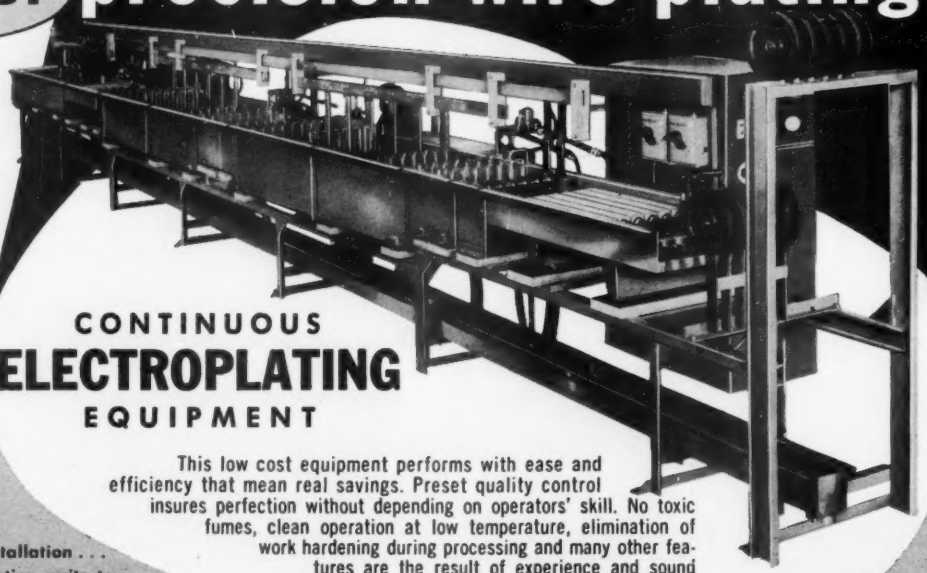
The process comprises winding a covering wire on a core wire to form a number of tightly wound, contiguous turns and securing at least one end of the covering wire to the core wire by applying, along an end length of the tightly wound covering wire forming a number of contiguous turns, forces increasing progressively in pressure to the end thereof to cause the material in the number of turns to flow in directions toward the end and to thereby conform the covering wire to the core wire and form a tapered end on the covering wire.

* * *

No. 2,969,195, COIL WINDING APPARATUS, patented January 24, 1961 by Marvin I. S. Leithe, Minneapolis, Minn., assignor to Cedar Engineering, Inc., St. Louis Park, Minn., a corporation of Minnesota.

Included is a reciprocating and oscillating of the core to be wound upon, which core is mounted in a chuck, with guide tube having a wire discharge end portion extending angularly from the guide tube and generally radially with respect to the core element mounted in the chuck, the discharge end portion being

LOW COST precision wire plating



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U. S. PATENT #2823180 AND FOREIGN PATENTS PENDING

alternately received between different selected circumferentially spaced pole pieces of the core during the reciprocatory and oscillatory movements of the core.

* * *

No. 2,969,827, AUTOMATIC WIRING MACHINE, patented January 31, 1961 by Felix Rosenthal, East Cleveland, Webster C. Roberts, South Euclid, and Robert F. Krejci, Cleveland Heights, Ohio, assignors to Clevite Corporation, Cleveland, Ohio, a corporation of Ohio.

The machine includes a first and second wire-wrapping tool, the latter mounted to be positioned initially adjacent the first tool, means for moving the second tool away from the first tool simultaneously along two transversely disposed coordinate axes, and a dressing finger mounted to be positioned between the first and second tools and moveable with the second tool away from the first tool along only one of the axes.

No. 2,969,888, WINDING MACHINE, patented January 31, 1961 by Theodore A. Whiting, Warren, R. I., assignor to Leesona Corporation, a corporation of Massachusetts.

Eight claims in this patent for winding electrical coils from ribbons of conductive material.

La Salle Licensed Canadian Firm

La Salle Steel Company, Chicago, Illinois, has concluded a license agreement with **The Canadian Drawn Steel Co. Limited,** Hamilton, Ont., covering manufacturing and sales rights for Stressproof steel bars as well as products made by the "e.t.d." (Elevated Temperature Drawing) process.

* * *

La Salle developed the "e.t.d." process for producing physical properties in bars that provide improved machining characteristics. Patent rights were obtained over four years ago covering the process. Commercial steel bar products manufactured in the United States by this process are sold under the following trade names: "Fatigue-Proof", "e.t.d." 150 Alloy and "e.t.d." 180 Alloy.

* * *

Among the principal benefits of using steel bars made by the "e.t.d." process are the elimination of heat treating and subsequent operations, such as cleaning, straightening, secondary machining and inspection following heat treating. Better machinability, longer tool life and greater uniformity are also claimed for these materials. Applications are for shafts, gears, pinions, fasteners and similar machine parts which are normally heat treated to obtain high physical properties.

Rome Cable To Meet Wire Needs of Missile Field

Expansion to meet the growing and complex needs of the missile, rocket, and electronic instrumentation fields was announced by the **Rome Cable Division** of Aluminum Company of America.

* * *

A. D. R. Fraser, Rome Cable president, said that the division has established new electrical cable production facilities, geared to these "markets of tomorrow," in a new plant here.

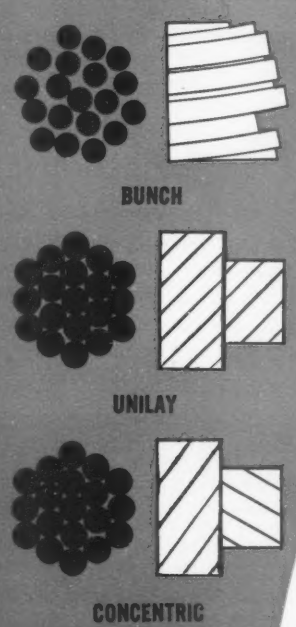
* * *

Called the Special Products Facility, this production unit now is fabricating cables and cable assemblies to customer specifications, providing users of specialized cables and cable assemblies with a source of supply coordinated from raw material through completed assembly.

* * *

Cabling and jacketing equipment

Which Wire Construction is Best . . .



Hudson makes all three in bare and plated constructions. Each is best suited for particular applications and insulating materials. For many years, the industry "standards" were bunch and concentric strandings. But with Hudson's marketing of unilay, there has been a strong swing to this versatile construction.

. . . for your Application

BUNCH constructions are generally used for flexible cords and fixture wires complying with UL standards, ASTM, and all military specs where permitted.

UNILAY constructions should be utilized where concentricity is a major requirement, or for economic reasons to get more for your insulating dollar. Since unilay constructions are preformed and twisted in the same direction, they are uniform and smaller in O.D. than bunched or concentric constructions. Unilay constructions are suited for all bunched applications, and are being substituted for concentrics in many applications with comparable performance at considerably lower conductor cost.

CONCENTRIC Where concentric strand conductors are required by customer or military spec, Hudson's concentric wires will meet the most exacting requirements.

For additional information on stranded and single-end conductors — bare and plated — write to:

HUDSON WIRE COMPANY
OSSINING DIVISION, OSSINING, NEW YORK / TELEPHONE: WILSON 1-8500

of the new unit provides for fabrication of prototype quantities of multi-conductor cables, in conductor sizes ranging from 28 AWG through 4/0 AWG. Planetary cabling equipment will accommodate as many as 330 conductors, to form a single cable as large as four inches in diameter. Specialty equipment of the new division is supplemented by Rome's bulk cable facility so that its total capabilities include prototype, short-run, and production quantities of special cables and assemblies.

* * *

Jackets for cables produced in the Special Products Facility are furnished in neoprene, polyvinyl chloride, or polyethylene materials, to various specifications. Conductors in the assemblies can be supplied to customer or military specifications. Cables combining shielded, insulated, coaxial and thermocouple wires are available. Coding of conductors in the cable, where required, is supplied either by color striping, braiding or printed numerals.

* * *

The new unit has complete electrical and physical testing facilities. Where such specifications exist, all materials used in cables or assemblies are certified under various military specifications. Termination of bulk cable, for instance, is to such specifications as MIL-W13777B, MIL-C-3432, and MIL-W-5756.

* * *

The new Special Products Facility is located in a new building in the east Los Angeles area, which also houses Rome's regional warehouse. The location places the plant close to Southern California's high concentration of aircraft, missile, and electronic industry centers.

* * *

Mr. Robert D. Golly has been assigned as general manager of the new facility.

New Low-Loss Electrical-Grade Polyethylene Announced

The development of a new polyethylene compound with superior low-loss electrical properties was announced today by **Union Carbide Plastics Company.**

* * *

Specifically designed for primary insulation of transoceanic submarine telephone cable systems now being planned, the material, designated Bakelite DFDA-0173 Natural, may prove valuable in high voltage applications and other areas where ultra-critical control of properties is required.

* * *

DFDA-0173 is characterized as an unmodified, very high molecular weight polyethylene compound containing only antioxidant. Technological developments have made it possible to actually increase the resistance to stress cracking while eliminating the butyl rubber formerly used in such compounds to inprove that property. This excludes the major source of contaminants previously encountered and permits the production of a compound of exceptional purity.

* * *

The composition, electrical characteristics and other pertinent

ALUMINUM INGOT AND MILL PRODUCTS: OCTOBER 1960

(Shipments and receipts are in thousands of pounds)

Item	Number of companies reporting shipments	October 1960			Sept. 1960 net shipments	Oct. 1959 net shipments
		Gross[1] shipments	Receipts[2]	Net[3] shipments		
ALUMINUM PIG AND INGOT, TOTAL	83	229,944	106,541	123,403	105,622	127,209
ALUMINUM MILL PRODUCTS, TOTAL	160	262,947	16,060	246,887	253,263	287,167
Sheet and plate, non-heat-treatable	25	100,126	9,628	90,498	98,766	104,274
Sheet and plate, heat-treatable	5	13,921	...	13,921	13,167	16,635
Foil, including foil in lamination	16	(D)	(D)	24,451	22,020	23,169
Rolled, and continuous cast rod and bar[4]	6	10,239	3,794	6,445	7,270	10,591
Wire, bare, conductor and nonconductor	15	4,625	216	4,409	4,483	5,508
ACSR and aluminum cable, bare	12	(D)	(D)	14,287	15,931	16,023
Wire and cable, insulated or covered	14	(D)	(D)	5,116	6,651	6,083
Extruded shapes, alloys other than 2000 and 7000 series	103	73,358	761	72,597	69,706	87,960
Extruded shapes, alloys in 2000 and 7000 series	7	2,803	...	2,803	3,057	3,528
Drawn tube, alloys other than 2000 and 7000 series	11	4,319	...	4,319	3,798	4,769
Drawn tube, alloys in 2000 and 7000 series						
Welded tube, non-heat-treatable	4	1,377	...	1,377	1,123	1,307

*Revised.

D Withheld to avoid disclosing figures of individual companies. These figures are included, however, in the appropriate total.

[1]Gross shipments of mill products represent total shipments by producers to customers, including other producers, and shipments by producers to their own fabricating departments which manufacture products beyond the level of mill shapes. Ingot gross shipments include shipments by importers.

[2]For mill products, represents receipts from domestic producers only. In addition to receipts from domestic producers, quantities of mill shapes were received through imports. It is not possible to publish this quantity for October 1960, however, without revealing the operations of individual companies. For ingot, receipts from imports are included.

[3]For mill products, derived by subtracting the sum of producer's domestic receipts of each mill shape from the industry's gross shipments of that shape. Ingot data derived by subtracting all receipts from shipments reported.

[4]Includes a small amount of rolled structural shapes.

properties of the new compound are controlled within rigidly narrow limits. This is of vital importance in the insulation of long conductors where variation in the dielectric constant, dissipation factor and even the thickness of the insulation reduces the efficiency of the cable.

Complete Louis Allis Motor Line

An 8-page Bulletin 2651 outlines an extensive line of electric motors to meet a broad field of applications.

* * *

The Bulletin features 23 types of motors with photographs and brief descriptions on application uses and available ratings, enclosures and modifications.

* * *

The line includes standard Squirrel Cage Motors in ratings from ¼ HP to 2500 HP and available in Open, Enclosed, Explosion and Weather-Protected enclosures along with many modifications such as C or D flanges, P base, and vertical mounting. It also includes Gearmotors to 150 HP, DC Motors to 400 HP, Wound Rotor Motors to 800 HP, Synchronous Induction Motors to 150 HP, plus Alternators, Generators and associated Control. Other specialized motors include Vertical Pump, Immersible, Brake, Rapid-Reversing, Textile, Rolled Shell Shaftless and compact Pancake Motors. In addition, many special mechanical and electrical motor designs can be readily supplied, including liquid-cooled, precision spindle and Multi-speed types.

* * *

Write the Louis Allis Co., 427 E. Stewart St., Milwaukee 1, Wisc., for a copy.

Federal Mfg. Names Sales Agent

The Federal Manufacturing Co., Wallingford, Conn., is pleased to announce the appointment of **Plastics & Equipment Sales Company,** 8232 Major Ave., Morton Grove, Ill., as their Mid-West Representatives, covering the States of Michigan, Indiana, Illinois and Wisconsin.

* * *

Plastics & Equipment Sales Company is headed by **John Clark,** who was formerly with Monsanto Chemical Company, Plastic Division, in this area.

Timing-Belt Catalog

Timing-belt drives for mechanical power transmission are available for load capacities from fractional horsepower up to 600 hp and for belt speeds up to 16,000 fpm. To select a timing-belt drive for any particular application, it is necessary to determine: circular and belt pitch (five stock pitches), drive width, pitch diameters of driver and driven pulleys, and belt pitch length. All the information needed to select the proper timing-belt drive with minimum arithmetic is packed into the 80 pages of Wood's new catalog No. 19103.

* * *

The comprehensive catalog features a series of copyrighted charts

the latest HIGH SPEED
TUBULAR STRANDING MACHINE
from HANSON & EDWARDS . . .

. . . for the cable and wire rope industries.

* External wire guides increase efficiency—reduce "down-time"—provide quick, easy threading.
* Overall dimensions reduced—increased speed.
* Electro-mechanical or electrically operated air brakes to choice.
* Rotor runs in large split roller bearings.
* Direct gear-driven capstan gives positive lays.

19-12½ bobbin machine, one of the new models now in production. The capstan unit, with cantilever mounted haul-off sheaves, is a complete separate unit coupled by shaft and flexible coupling to the main machine.

HANSON & EDWARDS LTD
WARRINGTON ENGLAND
SALES ORGANISATION:
JAMES DAY (MACHINERY) LTD 28 MADDOX STREET LONDON W1

U.S. AGENTS:
THE EDMANDS COMPANY 860 WELLINGTON AVENUE CRANSTON 10, R.I.

P5078

designed by the Wood's engineering department to provide graphical solutions in place of tedious numerical calculations. Full-page drive-width selection charts are also given for reach of the fine pitches. Twenty-seven pages of drive tables allow determination of driven pulley and belt pitch length when the speed ratio and driver pulley are known. If drive motor is either 1,160, 1,750 or 3,500 rpm, the speed ratio may be obtained without calculation, directly from these tables. The tables can also be used for speed up ratios.

* * *

For a copy of the catalog, write **T. B. Wood's Sons Co.**, Chambersburg, Pa.

Warm Heading Equipment

A new four-page folder from AmForge Division of **American Brake Shoe Company** illustrates and describes Reslec Unit, used for electrical resistance heating of wire as it enters a header machine. Low-voltage current passing through wire provides heat and a sliding thermocouple controls temperature at a value below critical point. Advantages claimed are easy working of parts, reduced work-hardening and longer die life. Equipment specifications and application examples given. Write Dept. A, American Brake Shoe Company, 530 Fifth Avenue, New York 36, N. Y.

F S to Supply Government With Carbide Powder

Firth Sterling Inc. is starting production on what is believed to be the largest single procurement ever placed for tungsten carbide powder, it was announced by **Kenneth D. Mann**, president. Under a barter contract recently awarded the Continental Ore Corporation, Firth Sterling will deliver 1,100,000 lbs. of tungsten carbide powder to the U. S. Government Supplemental Stockpile.

* * *

The material will be produced by Firth's carbide division over the next 22 months from South Korean raw materials to be provided by Continental. Under the provisions of the Department of Agriculture's barter program, the government exchanges surplus agricultural commodities for critical stockpile materials, including tungsten. Continental Ore will purchase tungsten ore from South Korea and dispose of the agricultural commodities abroad.

Laribee Wire Adds to Capacity

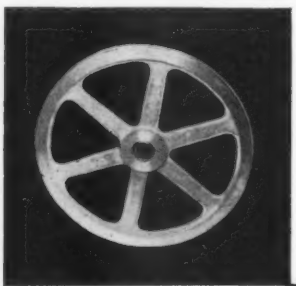
Laribee Wire, Inc., Camden, N. Y. has announced that additional machines have been installed. Equipment recently added includes a 12 bay cabling machine capable of producing wire up to size 2/0.

* * *

Laribee has also put in operation more fine wire drawing machines, that increase drawing capacity by 20%.

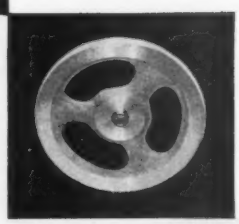
JOIN

THE WIRE ASSOCIATION



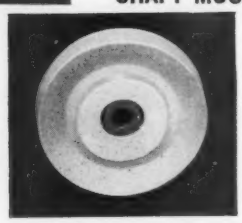
ALUMINUM SHEAVES

These Watkins Aluminum Sheaves offer outstanding advantages of ease of maintenance and long service life when used in gangs to guide wire through enamelling ovens and related equipments. Each sheave is machined from an aluminum casting. Large sheave is available with single or double groove.



	SMALL	LARGE
V-GROOVE ROOT DIA.	3¾"	8"
SHAFT SIZE	¼"-5/16"-⅜"	⅝"
WIDTH	¼"	3/16"
SHAFT MOUNTING	Oiled bushing	Needle bearing

NYLON IDLER PULLEY



The Watkins Nylon Idler Pulley combines the resiliency, high strength and low weight of nylon with the free-turning ball bearing to give outstanding performance wherever pulleys are used in fine wire drawing machinery.

SIZE:
1½" O.D. x 5/16" Wide

SHAFT SIZE:
3/16" Diameter

STYLE:
Single groove
Double groove

Other styles available to suit individual application.

R S WIRE MACHINES

Descriptive literature is available. Inquiries are invited.

R. S. WATKINS & SONS, INC. Glen Road, Sandy Hook, Conn.

The Color Reflectometer, An Instrument for the Continuous Measurement of the Color and Reflectivity of Fine Wire

(*Continued from page* 320)

ings. In the second test, spools of Formulations A and B were alternated during testing to minimize any effect of instrument drift. However, the oscillating drift was found to be only ± 0.01 millivolts (about 1% of the smallest reading), and therefore is negligible. An oscilloscope was used to visually monitor the pulse heights in order to detect inconsistencies in the readings or fatigue of the photomultiplier tubes.

* * *

The data of Table I reveal that

TABLE I

Comparison of Good and Bad Coiling 0.8 mil Tungsten Wires

Sample	Average Reading	Average Variation
Good Coiling	3.68 volts	0.209 volts
Bad Coiling	3.19 volts	0.537 volts

the poor-coiling wire has an average reflectivity 37% lower than that of the good wire. Furthermore, it is considerably less uniform as shown by the average variation which is a factor 2.5 times greater than that of the good wire. It is evident that the good wire has a far superior coating which may be a contributing factor in its better coiling behavior.

* * *

The differences between the two graphite formulations revealed in Table II are not as great, but are

TABLE II

Comparison of Two Graphite Formulations

Formulation A			Formulation B		
Sample No.	Average Reading	Average Variation	Sample No.	Average Reading	Average Variation
1	5.20	1.50	1	3.85	1.25
2	5.10	1.50	2	4.85	1.50
3	4.70	1.00	3	5.10	0.75
4	4.30	1.50	4	4.25	1.00
5	5.20	1.25	5	4.50	0.85
6	4.50	0.75	6	5.25	0.75
7	4.85	0.75	7	4.60	0.80
8	4.50	1.00	8	4.40	1.00
9	4.60	0.75	9	4.60	0.75
Average	4.77	1.11	Average	4.60	0.96

apparently real. Although there are overlaps in the readings of individual spools of the two formulations, when the averages are considered, Formulation A is seen to have a glossiness 3.7% greater and a non-uniformity 15.7% greater than Formulation B. Thus, it would appear to form a smoother coating, though one which does adhere as well.

Summation

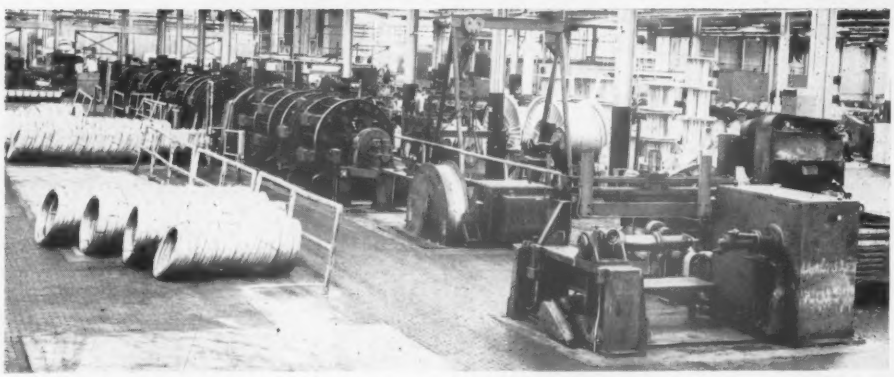
The Color Reflectometer was designed and constructed to provide a means for automatic and continuous measurement and control of the color of the oxide coating placed on the surface of tungsten in the wire drawing process. The preceding results have demonstrated that the instrument has more than adequate sensitivity and stability for this function. In addition, the instrument provides a reliable measurement of the average reflectivity and uniformity of coatings of constant color. Additional applications of the Color Reflectometer appear plausible.

* * *

A complete description of the construction and operation of the instrument, sufficient to permit its reproduction, has been given. It should be noted, however, that the

USED STRANDER AVAILABLE

1-SYNCRO MACHINE COMPANY 61-WIRE, 22" DIAMETER PLANETARY STRANDER, CONSISTING OF:



1 — 6-BOBBIN SECTION
1 — 12-BOBBIN SECTION
1 — 18-BOBBIN SECTION
1 — 24-BOBBIN SECTION
ARRANGED IN TANDEM
1 — 72" DIAM. SINGLE CAPSTAN
1 — 84" TAKE-UP STAND

THIS MACHINE IS COMPLETE IN EVERY DETAIL AND CAN BE SEEN

WRITE!! WIRE!! PHONE!!

WEST COAST:
WESTERN WIRE & TEXTILE MACHINERY, INC.
228 SHAW ROAD
SOUTH SAN FRANCISCO
CALIFORNIA — JUno 9-1101

EAST COAST:
WIRE & TEXTILE MACHINERY, INC.
331 ROOSEVELT AVENUE
PAWTUCKET
RHODE ISLAND — PAwtucket 2-7750

Color Reflectometer was built on a laboratory level and tested in an experimental pilot plant wire drawing line. It is probable that an instrument intended for use in production would require revisions to increase its ruggedness and environmental stability.

Do Molybdenum Disulfide–Containing Wire Drawing Lubricants Have a Place in Your Mill?

(*Continued from page* 314)

High Carbon Wire — A large steel company has increased wire-drawing speeds of high carbon wire several hundred feet per minute through the use of Molysulfide lubricants, which in some cases double the drawing speed. The Molysulfide lubricant has also been used successfully by this company on aluminum core wire and other high carbon wires that are used in its own plant, principally for galvanizing and other process wires.

* * *

Spring Wire — Another steel company is conducting tests on the effectiveness of Molysulfide lubricants on the drawing of upholstery spring wire. Test lots are currently in the hands of a number of spring manufacturers. Preliminary results have been encouraging.

* * *

Chain Link Fence Wire — National Fence Manufacturing Company started drawing two-hole, 10-gauge wire on double deck machines without previous experience using a mechanical descaler. Production was good from the outset and it was found that the Molysulfide-coated surface of the wire helped the life of the former tool in the chain link fence machine. The National Fence Manufacturing Company also claims the Molysulfide lubricant has helped in their galvanizing process.

Molysulfide No "Cure-All"

As a lubricant additive, Molysulfide is no wire-drawing cure-all. As a result of improperly formulated Molysulfide wire-drawing compounds, many companies became discouraged. Performance results to date, some of which have just been reviewed, however, have been encouraging on so broad a front in the wire-drawing industry that more companies are undertaking Molysulfide evaluation projects in efforts to further reduce operating costs and improve product quality. These recent encouraging results are due in great part to the increased knowledge which has led to the proper formulation of Molysulfide-bearing compounds for specific applications. Currently, it is estimated that 10 to 15 percent of all wire-drawing lubricants contain Molysulfide and this percentage is growing rapidly each year.

Have you considered joining

THE WIRE ASSOCIATION?

Write for booklet and an application for membership

453 Main Street Stamford, Conn.

COPPER - Consumption of refined copper in the United States, September-October 1960, in short tons

	Wire mills 1/	Brass mills 2/	Chemical plants	Secondary copper smelters	Foundries and miscellaneous	Total
September:						
Cathodes	488	6,946	(3)	90	(3)	7,524
Wire bars	72,404	4,375	(3)	---	(3)	76,779
Ingots and ingot bars	883	6,206	(3)	50	(3)	7,139
Cakes and slabs	------	13,587	(3)	---	(3)	13,587
Billets	------	13,877	(3)	---	(3)	13,877
Other	77	------	(3)	3	(3)	80
Total	73,852	44,991	(4)	143	(4)	4/120,986
October:						
Cathodes	624	6,918	(3)	66	(3)	7,608
Wire bars	65,698	4,063	(3)	---	(3)	69,761
Ingots and ingot bars	1,125	4,872	(3)	156	(3)	6,153
Cakes and slabs	------	12,640	(3)	2	(3)	12,642
Billets	------	13,903	(3)	---	(3)	13,903
Other	60	------	(3)	2	(3)	62
Total	67,507	42,396	(4)	226	(4)	4/112,129

1/ Includes all wire mills with rod-rolling facilities. 2/ Includes all brass mills using copper in refinery shapes; some have rod-rolling facilities. 3/ Not available. 4/ Consumption by chemical plants, foundries, and miscellaneous plants not included. Estimate of 2,000 tons included in total.

Quality Control in the Wire Industry

(*Continued from page 327*)

to a great deal of investigation. Help can be given by the various publications listed below, and many others, but at least it is hoped that this paper will be the foundation of much more thought on the subject of Quality Control in the Wire Industry.

Bibliography

"*Facts from Figures*" by: M. J. Moroney (Pelican Book)

"*The Application of Statistical Methods to Industrial Standardisation and Quality Control*" by: E. S. Pearson, D.Sc. (British Standards Institution — BS600 1935)

"*Quality Control Charts*" by: B. P. Dudding, M.B.E., Ph.D., and W. J. Jennett, B.Sc. (Eng.)(British Standards Institution — BS600R 1942).

"*Control Chart Technique When Manufacturing to a Specification*" by: B. P. Dudding, M.B.E., Ph.D. and W. J. Jennett, B.Sc. (Eng.) (British Standards Institution — BS 2564 1955).

Construction Details and Processing Methods of Geophysical Cables

(*Continued from page 334*)

retroflexed pattern that we are able to operate three of them in the area normally occupied by one of standard design.

* * *

To facilitate the process of tubing a thicker wall of plastic where takeouts are to be made on an all-vinyl assembly, our capstans are controlled by a variable voltage rectifier circuit which allows the capstan to be slowed down to a preset lower speed for as long as the spring loaded switch button is held in the depressed position.

* * *

Another production feature, not exactly unique with us, is the use of refrigerated water on the rubber mills. However I would like to point out that our use of an individual 10 ton rated water chiller on each 40 inch mill enables us to handle stocks in production where rubber is mixed with a Butyl Eight-Sulfur cure, and neoprene containing a zinc oxide-litharge-diethylthiourea cure is handled regularly. These accelerated compounds, incidentally, are stored in a large commercial refrigerator kept at 38°F.

* * *

Curing rubber or neoprene jackets over cable assemblies containing thermoplastic insulated conductors is not too difficult a process but molding the additional accessories used in geophysical work required the development of a low-temperature, low-pressure transfer molding operation.

* * *

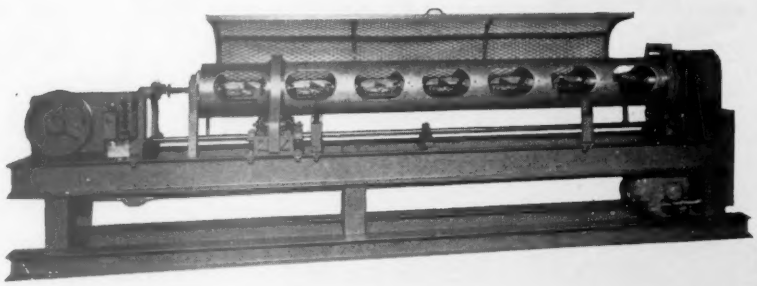
The basis of this set-up is the use of aluminum mold inserts which are interchangeable in aluminum heater blocks containing thermostatically controlled cartridge heaters. The entire mold assembly is held shut by a pair of hydraulic toggle clamps which lock the mold against a bed plate and the transfer is made by an independently operated hydraulic ram. There are no corner bolts to inter-

SEVEN BAY HIGH SPEED STRANDER

MODEL 7 B 55

This precision, perfectly balanced machine features: rigid steel box structure-barrels of high strength ALCOA alloy — motor mounted below center of gravity — safe, positive drive — push button controls— carbide wire guides — interchangeable cradle assemblies — standard cradles taking 7" diam. X 4" Traverse Spools — 30 lengths of lay.

BARTELL FOR THE BEST



• CATERPILLAR CAPSTANS • SINGLE & MULTIPLE HEAD RESPOOLERS • WIRE STRANDERS
• TAKE-UP & PAY-OFF STANDS FOR PLATING EQUIPMENT

BARTELL MACHINE-TOOL CORP.
YACHT CLUB ROAD ROME, N. Y.
• DESIGNERS • MANUFACTURERS • ENGINEERS • CONSULTANTS

WE ALSO DESIGN AND BUILD SPECIAL EQUIPMENT TO MEET SPECIFIED REQUIREMENTS

fere with cable handling as would be the case with a standard hydraulic press. Each molding unit has its own air-operated Alemite pump as its source of hydraulic pressure thus allowing complete flexibility of operation. The typical molding cycle on a part of about 1/2 inch wall thickness is 12 minutes at 190°F.

* * *

One final feature which the average cable man would find to be a bit different in our plant is the fact that our cables during processing are handled in caster-equipped boxes or fiber-pack drums rather than on reels. This unusual manner of cable handling has proved to be the safest and most efficient for our operation which in itself is different from most conventional wire and cable manufacture.

Wire Cloth Firm To Establish in California

Keystone-Seneca Wire Cloth Company has purchased a modern building at 210 W. Walnut St., Fullerton, Calif., with 44,000 square feet floor space and is installing equipment to produce a full line of Insect Wire Screening, it was announced by the company's president, **John H. McNerney.**

* * *

The plant will be headquarters of the Company's Western Division and will complement operations of the Southern Division plant at Brookhaven, Miss., and the Eastern Division plant at Hanover, Pa.

* * *

The new plant will make Keystone-Seneca Wire Cloth Company the only producer with three integrated screen cloth manufacturing units located strategically for nationwide customer service.

* * *

It will be under the over-all direction of Kenneth Walker, Plant Manager, and William Kempton, Sales Manager. Local management will be in the hands of Carl Ziegler, Superintendent and Ed Rosenthal, Sales Representative, both of Los Angeles.

* * *

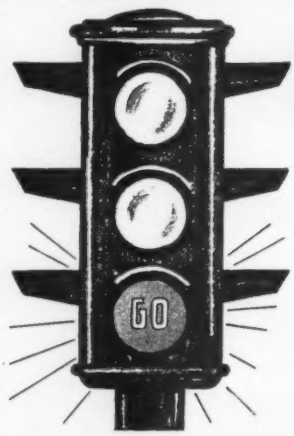
Present schedules call for the plant to be in full operation by March of this year. Keystone-Seneca Wire Cloth Company is a wholly owned subsidiary of Seneca Wire & Manufacturing Co., Fostoria, Ohio, a concern founded in 1905.

Carbro Bought by Sun Chemical

Carbro Chemical Company of Pawtucket, R.I., manufacturers of electrical wire coatings, has just been acquired by **Sun Chemical Corporation** and will be integrated into that company's recently-formed Chemical Coatings Division. According to **Carl Bauer,** vice president and general manager of Sun's Chemical Coatings Division, the Rhode Island concern will continue to produce its full line of insulating coating materials and saturants but will have full access to the parent company's research and marketing facilities.

* * *

Carbro's president, **John Francis**



PICKLING PROBLEMS?

GO! GO! GO!

with NEP 33 for pickling

- SPRING WIRE
- ALLOY WIRE
- COPPER COATED WIRE

For finer quality in your Drawing Room, Specify

NEP No. 33 INHIBITOR

PARKIN CHEMICAL COMPANY

HIGHLAND BLDG. • PITTSBURGH 6, PA.

Brown, will retire as active head of the acquired company but will continue in a consulting capacity. He organized Carbro in 1939 to produce coating materials for manufacturers in the electrical industry.

* * *

Among the many products made by Carbro are non-metallic sheathed cable finishes, neoprene jacketed cable paints, aluminum varnishes for shipboard cables, asphaltic materials, asbestos wire saturant solutions, white lacquers, code wire paints and lacquers, and pre-saturants.

Anaconda Develops Hot-Box Detector Cable

A highly specialized cable especially designed for use by railroad engineers in systems for hot-box detection has been announced by **Anaconda Wire & Cable Company.**

* * *

With the new cable, vital modern protection systems can be installed at far lower cost than by adapting telephone cable, line wire, or similar constructions not specifically designed for this use.

* * *

The new half-inch diameter, six-conductor cable can be installed on an existing pole line using standard cable grips. Employing a built-in messenger of extra-high-strength copper-covered steel, the cable is self-supporting even under heavy loads of ice or snow.

* * *

The six copper conductors are polyethylene insulated in individual colors — another innovation in cable of this type. The messenger is covered with polyvinyl chloride rated at 80C and the over-all jacket is of Anaconda PVC Densheath.

* * *

Many railways now use infrared hot-box detection devices at trackside to pinpoint dangerously overheated journals, that relay readings to control towers as far as 100 miles distant where the data are recorded on permanent graphs, alarms are sounded, and block signals to warn engineers and stop trains are automatically set. Until Anaconda developed a job-designed cable, system engineers were forced to adapt existing cable types at the risk of sacrificing maximum reliability and often at increased expense.

* * *

For more information on the new Hot-Box Detector Cable write: Department EFL, Anaconda Wire & Cable Company, 25 Broadway, New York 4, N.Y.

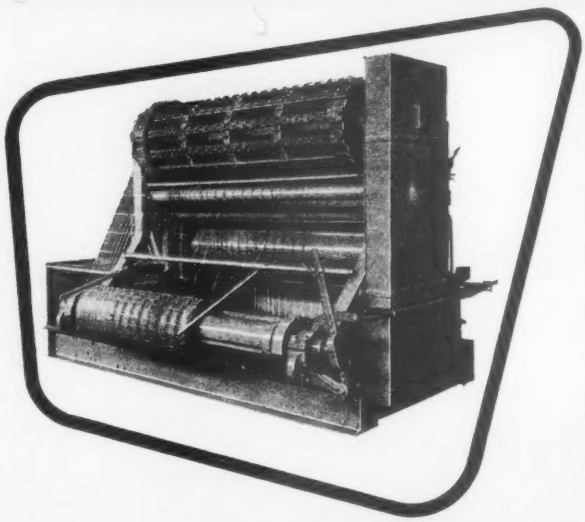
Bulletin on New Wire Rope Design

A new bulletin is available which catalogs and describes a new wire rope design offered by **Macwhyte Wire Rope Co.**

* * *

Essentially, it consists of seven rope strands helically laid around a core. It is a true 7-strand wire rope plus an independent wire rope core. This embodies the flexibility of 8-strand rope, the fatique-resistance of 6x37 rope, and the ruggedness of 6x19 rope.

Interlocking FENCE LOOMS



- Fastest—Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated—Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

SPECIALISTS IN FENCE LOOMS

Copy of new bulletin is free. Ask for Bulletin No. 60100 from Macwhyte Wire Rope Company, Dept. P. R., Kenosha, Wisconsin.

Multiple Lifts of Wire Fabric Raise Street Grade

The first known use of multiple layers of wire reinforced asphaltic concrete to raise the grade of an existing street was successfully completed in one day last fall on a section of Broadway in Oyster Bay, N.Y.

* * *

Broadway is a major road in the Oyster Bay highway system, serves a large suburban area in Long Island, and carries heavy shopping traffic and commuting traffic to and from the Long Island Railroad, which overpasses the street at this point. To handle the steadily increasing traffic, authority was given to widen Broadway near the railroad station from 40 feet to 60 feet.

* * *

The original street consisted of two 9' wide lanes of concrete with 11 foot wide compacted shoulders on each side. In planning the widening, it became apparent that a change in grade of the over-all pavement would be required in order to conform to the existing first floor elevations of the adjacent stores and offices. In some places this change in grade was as great as 14 inches.

* * *

The first step was placement of a 6" thick base course of concrete in strips approximately 20 feet wide on both sides of the existing 18' wide concrete pavement, and at a level 2½" less than the new grade. New curbing was poured monolithically with these exterior strips.

* * *

Review of successful experience of others in using welded wire fabric to reinforce asphaltic concrete overlays and thus reduce "shoving" failures at bus stops, intersections, and other locations subject to lateral loadings, prompted a decision to reinforce each successive 4" thick layer of bituminous concrete with 6x6-10/-10 wire fabric, involving a 350 foot section of the street.

* * *

The wire fabric was placed, the 6x6-10/10 (six inch spaced wires in each direction of #10 gauge) reinforcement being delivered to the job in sheets 25 feet long, 114" wide. The sheets were placed longitudinally, along the axis of the pavement, the 9½ foot widths affording about 6 inches of overlap at the center of the 18 foot width, with about 1½" of clearance at the edges.

* * *

After compaction of the entire area, the operations were repeated for succeeding lifts (or partial lifts) until the grade had been raised (up to 14") to the required elevation.

Bulletin on Reels For Handling Wire Coils

Durant Tool Co., 15 Thurbers Ave., Providence 5, R. I., has issued

---

AMERICAN IRON AND STEEL INSTITUTE
150 EAST FORTY-SECOND STREET, NEW YORK 17, N. Y.

AIS 10

SHIPMENTS OF STEEL PRODUCTS
ALL GRADES INCLUDING CARBON, ALLOY AND STAINLESS
(NET TONS)

DECEMBER - 1960
Month

Covering Net Shipments (Excluding Shipments to Members of the Industry for Conversion into Further Finished Products or for Resale)

STEEL PRODUCTS	Item	CURRENT MONTH 1960 CARBON	ALLOY	STAINLESS	TOTAL	Percent of Total Shipments	Prior Year (1959) Percent of Total Shipments	YEAR TO DATE * 1960 CARBON	ALLOY	STAINLESS	TOTAL	Percent of Total Shipments	Prior Year (1959) Percent of Total Shipments
Ingots and Steel Castings	1A	8,768	7,282	1,482	17,532	0.4	0.8	202,354	111,948	23,340	337,642	0.5	0.5
Blooms, slabs, billets, sheet bars	1B	69,270	24,946	1,217	95,433	2.3	2.7	1,020,114	380,041	18,326	1,418,481	2.0	2.2
Tube rounds	1C	225	122	-	347	-	-	12,179	4,501	25	16,705	-	-
Skelp	2	14,459	-	-	14,459	0.4	-	130,203	1	-	130,204	0.2	-
Wire rods	3	49,404	1,334	670	51,408	1.2	1.5	882,321	25,751	10,123	918,195	1.3	1.4
TOTAL SEMI-FINISHED		142,126	33,684	3,369	179,179	4.3	5.0	2,247,171	522,242	51,814	2,821,227	4.0	4.1
Bars--Hot Rolled (Inc. Light Shapes)	14	308,778	80,437	3,213	392,428	9.5	11.0	5,361,727	1,491,962	41,746	6,915,435	9.7	10.0
Bars--Reinforcing	15	148,382	-	-	148,382	3.6	2.6	2,214,498	-	-	2,214,498	3.1	3.1
Bars--Cold finished	16	58,161	12,857	3,585	74,603	1.8	1.9	1,096,777	236,921	51,635	1,385,333	2.0	2.0
Tool Steel	17	531	5,166	-	5,697	0.2	0.1	9,992	76,792	-	86,784	0.1	0.2
TOTAL BARS AND TOOL STEEL		515,852	98,460	6,798	621,110	15.1	15.6	8,702,994	1,805,675	93,381	10,602,050	14.9	15.3
Wire--Drawn	23	153,740	2,435	1,505	157,680	3.8	3.9	2,374,977	41,474	23,480	2,439,931	3.4	3.9
Wire--Nails & staples	24	15,522	-	1	15,523	0.4	0.5	320,393	-	9	320,402	0.5	0.6
Wire--Barbed & twisted	25	2,793	-	-	2,793	0.1	-	47,850	-	1	47,851	0.1	0.1
Wire--Woven wire fence	26	4,595	-	-	4,595	0.1	0.1	103,877	-	-	103,877	0.1	0.2
Wire--Bale ties & baling wire	27	1,849	-	-	1,849	-	0.1	62,707	-	-	62,707	0.1	0.1
TOTAL WIRE & WIRE PRODUCTS		176,499	2,435	1,506	182,440	4.4	4.6	2,909,804	41,474	23,490	2,974,768	4.2	4.9
Black plate	28	31,760	-	-	31,760	0.8	0.7	576,198	-	-	576,198	0.8	0.8
Tin & terne plate-hot dipped	29	16,394	-	-	16,394	0.4	0.4	389,986	-	-	389,986	0.6	0.6
Tin plate-Electrolytic	30	239,978	-	-	239,978	5.8	5.6	5,075,502	-	-	5,075,502	7.1	7.0
TOTAL TIN MILL PRODUCTS		288,152	-	-	288,152	7.0	6.7	6,041,686	-	-	6,041,686	8.5	8.4
Sheets--Hot rolled	31	435,259	12,337	2,055	449,651	10.9	11.6	7,719,425	247,224	24,099	7,990,748	11.2	11.3
Sheets--Cold rolled	32	851,715	2,886	11,076	865,677	21.0	19.5	14,278,831	50,781	136,649	14,466,261	20.3	18.4
Sheets--Galvanized	33	165,630	-	-	165,630	4.0	3.7	3,056,631	365	-	3,056,996	4.3	4.0
Sheets--All other coated	34	13,923	-	-	13,923	0.4	0.3	261,203	-	-	261,203	0.4	0.4
Electrical sheets & strip	35	2,464	33,264	-	35,728	0.9	0.9	43,425	524,395	-	567,820	0.8	0.9
Strip--Hot rolled	36	82,625	1,000	896	84,521	2.1	2.0	1,306,132	20,299	5,849	1,332,280	1.9	1.8
Strip--Cold rolled	37	66,737	953	11,691	79,381	1.9	1.9	1,128,713	16,424	180,665	1,325,802	1.8	2.0
TOTAL SHEETS AND STRIP		1,618,353	50,440	25,718	1,694,511	41.2	39.9	27,794,360	859,488	347,262	29,001,110	40.7	38.8
TOTAL SHIPMENTS (1960)		3,820,945	252,789	42,313	4,116,047	100.0	xxx	66,189,250	4,381,441	578,527	71,149,218	100.0	xxx
TOTAL--PRIOR YEAR (1959)		7,585,670	548,261	77,116	8,211,047	xxx	100.0	64,172,095	4,590,378	614,594	69,377,067	xxx	100.0

* Revised

a bulletin describing a complete line of automatic and motor-driven stock reels for all coil handling operations.

* * *

These range from simple light duty, pay-off types to heavy duty, power-driven stock reels for heavy coils of wire and narrow flat stock. The bulletin pictures and gives sizes, weights, types of brakes and drags on the various models, and other pertinent data.

* * *

A copy of the bulletin is available upon request to the company.

Pros and Cons on Leasing Autos

A third revised edition of a 28-page study on the pros and cons of leasing auto fleets by industry has just been issued by the **Foundation for Management Research.**

* * *

It is entitled, "Advantages and Disadvantages of Auto Fleet Leasing: A Comparison of Company Ownership, Salesman Ownership and Leasing." New data has been included in the latest edition concerning the shift of industry toward leasing auto fleets. Situations in which companies are better off leasing are discussed, as well as situations in which other methods of fleet ownership are preferable.

* * *

Single free copies of this study may be obtained by executives by writing to the Foundation for Management Research, 121 West Adams St., Chicago 3, Ill.

Set Screw Bulletin

A 4-page bulletin, fully detailing their line of "No-Mar" Set Screws, is available from **PIC Design Corp.,** East Rockaway, N. Y.

* * *

An original design by PIC, these set screws contain a nylon insert, which prevents burring or nicking of precision shafts, and insures locking power as the nylon compresses into the thread of the holding member. Their use eliminates troublesome assembly or disassembly of precision parts and components caused by the burring action of conventional set screws. They are stocked in screw sizes from #2-56 to 1/4-20, with slotted or socket heads.

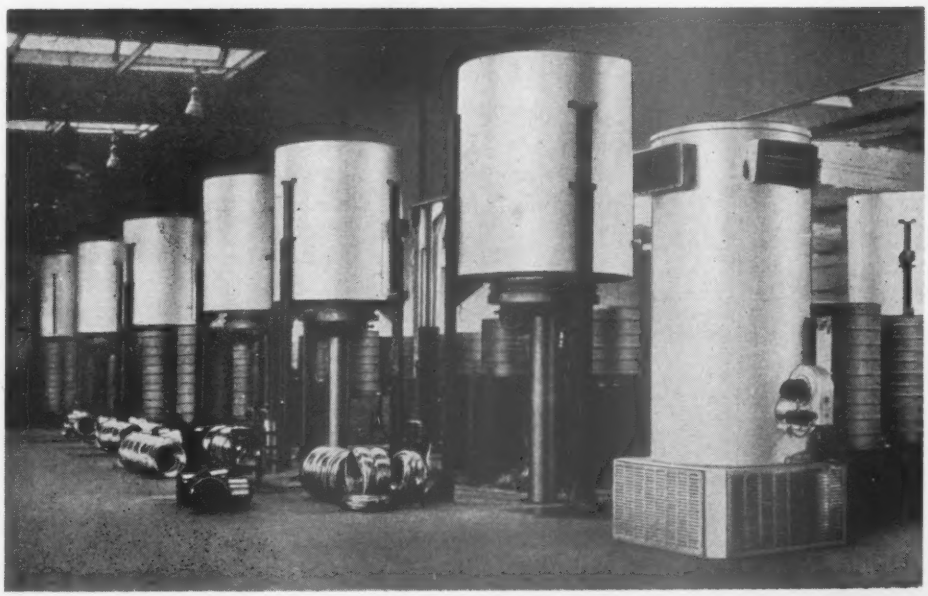
* * *

Copies of this new bulletin, and sample screws for test and evaluation, are available from PIC Design Corp., 477 Atlantic Ave., East Rockaway, L. I., N. Y.

Carpenter Steel Triples Service Facility in Los Angeles

The Carpenter Steel Company has tripled its Los Angeles area facilities with the opening of a new $300,000 mill-branch warehouse and specialty steel service center. Completed in January, under the direction of **David J. O'Neil,** Pacific regional manager, it is the latest step in a program to increase Carpenter's warehousing capacities and steel user services on The West Coast. On the national scale, other recent expansions include new service centers and warehouses in Cleveland and Philadelphia, and a

THE LAST WORD IN MODERN EFFICIENT DESIGN!



SEVERAL VACUUM BRIGHT ANNEALING UNITS WHICH WE HAVE INSTALLED IN ONE OF THE MOST PROMINENT CABLE WORKS IN GERMANY

(German and Foreign Patents)

*

SOLE REPRESENTATIVE:
PAUL REICHER
Machinery & Equipment
600 Eglington Ave., East,
Toronto 12, Ont., Canada

OFENBAU **FRITZ** G. m. b. H. & Co. K. G. **HAGEN,** (W.-GERMANY)

sales office in Dallas.

* * *

The new center comprises about 20,000 square feet of floor space. **Robert W. Titgemeyer,** Los Angeles branch manager, will direct operations at the facility. A full line of specialty tool, stainless and alloy steels will be stocked. The center also offers complete technical services to steel users.

New Fluxless Solder

A new solder that will join any metals except black or cast iron has been developed. Called "Tin-A-Lum", the solder requires no flux and may be applied with an ordinary soldering iron or a torch.

* * *

The solder, which melts at 210°C, was designated for use on aluminum or zinc-based metals, but will work well on other metals and will repair such things as carburetors, cylinder heads, pulley wheels, crank or gear box cases. While soldering irons may be used, the metal object to be repaired can be heated to 210°C, and the solder applied, the heat of the object being sufficient to form a good bond.

* * *

Tin-A-Lum soldered objects can be machined, if desired. The material presently is made in 2 oz. sticks, but shortly will be extruded into rolls of various thicknesses.

* * *

Additional details are available from Metals for Industry, Inc., 299 Pavonia Ave., Jersey City 2, N. J.

Unit for Preheating Heading Wire

The Amforge Division, **American Brake Shoe Co.,** 1435 Preston St., Rockford, Ill., has issued a bulletin entitled "Reslec® Warm Heading", describing an electric resistance heating unit to heat wire before it enters a heading machine.

* * *

The device is said to provide many advantages in heading high-strength, high-temperature alloys, by keeping the wire as it moves at a pre-set temperature. The advantages claimed are reduction in work hardening, operation at high efficiency, lowering of power requirements, elimination of scaling, and savings in time, money, material and dies.

* * *

Copies of the bulletin are available upon request to the Amforge Division.

New Firm to Serve Wire Industry

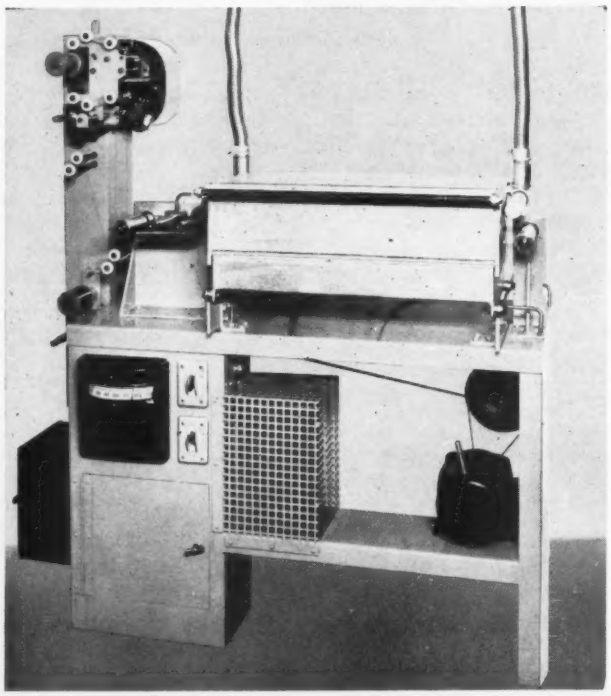
The Plastics & Equipment Sales Company, 8232 Major Ave., Morton Grove, Ill., was recently formed by **John B. Clark** to specialize in the sale of materials and equipment to electric wire insulating companies in the upper central area of the United States.

* * *

Mr. Clark, a 1953 graduate, Notre Dame University, has had five years of experience in the sale of insulating materials for the Monsanto Chemical Company's Plastics Division. While the organization now has connections with a number of firms, it will entertain the extension of its services to others who would like to have aggressive representation in the area served.

HORIZONTAL FINE WIRE ENAMELING MACHINE

1247



SPEEDS 50-200 F. P. M.—WIRE SIZES DOWN TO .0005
EASY STRING UP

EST. 1855 AIMCO INC. 1915
"American" AIMCO INSULATING MACHINERY COMPANY
TRADE MARK
FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.
MANUFACTURERS OF WIRE INSULATING MACHINERY AND ALLIED EQUIPMENT. MACHINERY MFG. TO CUSTOMERS SPECIFICATIONS.

We manufacture a full line of enameling machines from the heaviest flat wires to the smallest diameters.

OTHER PRODUCTS:

Taping machines; tinning outfits; spoolers; insulation winding machines; special machinery according to customers' specifications.

The Decarburization of Steel Wire

(*Continued from page 339*)

pheres very rich in hydrogen, and will therefore not here be further discussed.

* * *

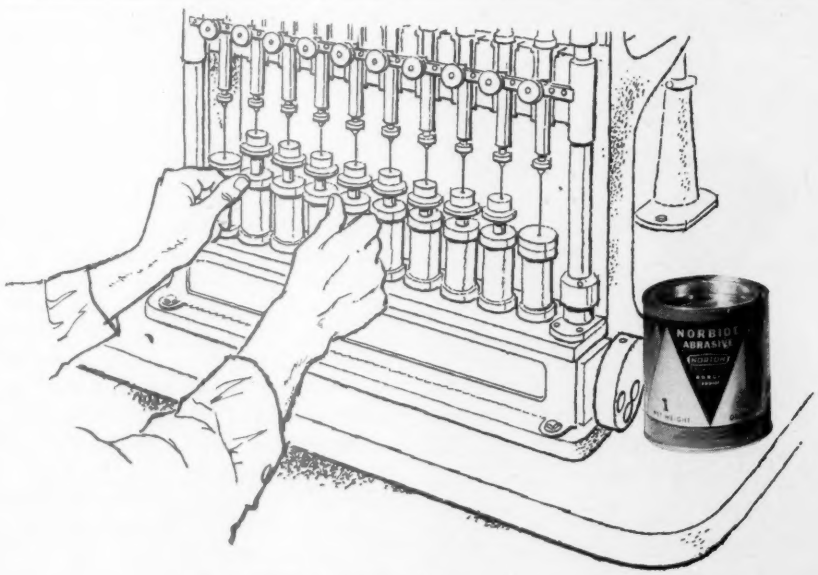
The most commonly occurring oxygen decarburization takes place only on the surface, because the rapidity of diffusion of the carbon outward is greater than that of the oxygen toward the interior. The primary cause of the decarburization lies in the majority of all cases not originally in the annealing, which is mostly carried out at about or under atmospheric pressure, but at the much higher temperatures of forging, rolling and also of the hardening. As in the heating up to rolling temperature mostly exhaust gases and air dominate the surrounding atmosphere, and the waiting time is often very long, the best conditions are present for decarburizing and scaling.

* * *

If the rapidity of decarburizing and scaling were equal, the decarburized layer would always scale at once and the descaling would disappear. The higher the temperature the more the decarburization however runs ahead of the scaling. Out of this is also clarified the strengthened tendency to decarburization of steels alloyed with Cr, Si and Al, because with these the rapidity of scaling is diminished. With steel alloyed with Co on the other hand the danger of decarburization is greater because the diffusion constant of the carbon is increased. Though the principal cause of decarburization is mostly the heating to rolling temperature, nevertheless the danger of decarburization through the annealing should by no means be disregarded. Even when annealed under buffer gas of unobjectionable composition, a still adhering layer of scale or a remnant of drawing grease on the annealing material can occasion decarburization. Grosser faults are for example leakiness of the annealing pot and faulty composition of the protective atmosphere. Somewhat the same applies also to hardening. Here the periods are of course shorter, therefore the temperature is accordingly higher.

Possibilities of Avoiding and Eliminating the Decarburization

The starting points of the avoidance of decarburization are given in the foregoing. On grounds of the knowledge of the causes it can be attempted to get at the root of the evil. What can now be done in the cogging mill in order to avoid decarburization? As it is impossible to set the entire heating furnace and roll stands and cooling pits under buffer gas, there remains only the holding of the heating time as short as possible and the rolling temperature as low as possible. Further, in the heating furnace a strongly oxidizing atmosphere can be used by which the scaling rate will not be too low relative to the decarburizing rate. In spite of this it will not be wholly possible to avoid the rolled billet showing decarburization. This can be eliminated relatively simply by grinding off the surface layer. In order now not to create decarburization anew



NORBIDE* Abrasive
costs 300 times less than diamonds...
You can't beat this economy!

For high quality die refinishing — plus savings that are substantial and sure — here's something worth remembering:

Although NORBIDE *grain is next to diamonds and diamond dust for hardness this record-making abrasive costs only one three-hundredth as much as sized commercial diamonds!*

It will pay you to get the whole story of how this outstanding member of the Norton family can bring new efficiency and economy to your die refinishing operations — including ripping, semi-finishing and finishing. Can be used in liquid vehicle or in compound form.

NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries

NORTON
BORON CARBIDE

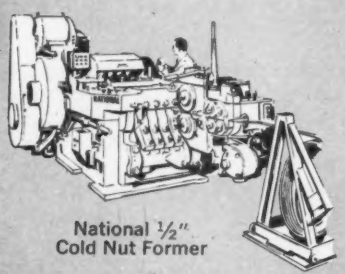
G-399

75 years of . . . Making better products . . . to make your products better
NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

These unusual nut blanks are formed *automatically* — on compact, efficient National Cold Nut Formers.

Quality is excellent, scrap is low and remarkable savings are realized over other methods.

Send us your "Tough Nut Projects." Better yet, come to Tiffin where we can concentrate on *your* nut production. No obligation.



National ½" Cold Nut Former

(Available in sizes ¼" through 1")

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U.S.A.

HARTFORD DETROIT CHICAGO

by the heating of the billet for the wire rolling, this heating should take place very quickly. This difficulty is solved by the procedure brought out by **W. Stitch** of resistance heating with heating time of less than two minutes. According to **W. Rieman** (see **Stahl und Eisen** 77-1957, pp 403/404) inductive heating requires heating time of equal length, while by rapid heating in gas furnace periods of 4 to 6 minutes are found necessary. All three quick heating procedures are naturally, respecting the decarburization, better than the long continued heating in the continuous type furnace. Up to now, of the three mentioned procedures, the resistance heating has been the best introduced. In order also to avoid the decarburization possibly resulting from quick heating and subsequent wire rolling, many firms have considered combatting the decarburization possibly refinished wire rod through paring off a sufficiently thick rim layer at the outset. In this case the foregoing measures of precaution as well as the rapid heating can be neglected, and at the same time other surface faults on the rod can be eliminated. In the individual case calculations of economics have to decide which procedure will give the advantage. Before the wire drawing the rod frequently still undergoes a scale forming annealing in order to remove decarburized rim layers. Thereby one must be very careful that no new decarburization develops. In wire annealing the use of buffer gas or vacuum furnace is imperative. Many times it is even attempted through carburizing annealing to cancel an existing decarburization. In annealing itself care must be taken that the annealing pot is tight, that the buffer gas has the correct composition, and that no scale adheres to the wire. There are also drawing compounds that give rise to decarburization on the wire in the annealing. In the hardening just as for the annealing, the buffer gas employed must be unobjectionble, and sufficient positive pressure must exist in the furnace. If from the rolling to the

need a **heat stable** lubricant?

FLEXIMET PCM*

Here's a tough heat stable protective lubricant fortified with extreme pressure additives to promote optimum lubricity. The resulting coating provides good protection and "built-in" lubrication for finished rope or cable wire. Designed to remain stable after stress relief, heat treatment or patenting.

Use Fleximet PCM as received, directly in die box.

WRITE SWIFT FOR BULLETIN 46 and details on other FLEXIMET products

* *A metallic base lubricant, fortified with additives including molydisulfide to provide EP properties.*

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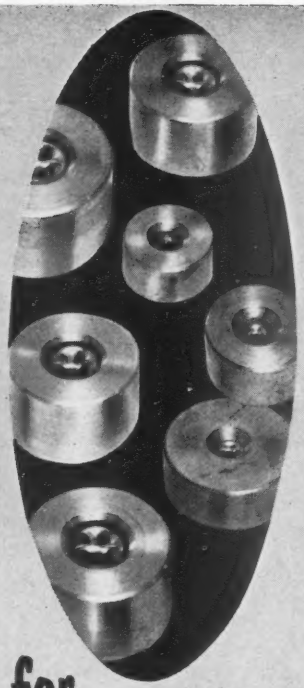
S-76

Swift
METALLIC COMPLEXES

106TH YEAR



for predictable performance, finish your dies with

HYPREZ DIAMOND COMPOUNDS

Our rigid laboratory controls guarantee unfailing uniformity of Hyprez grading and concentration. That's one important reason for Hyprez superior performance—shorter finishing time — longer die life, greater production. Want proof? Ask your nearby Hyprez distributor for a free demonstration.

. . . or write for Technical Bulletin HW-49

HYPREZ DIVISION
ENGIS EQUIPMENT CO.
431 S. Dearborn St., Chicago 5, Illinois

wire user all decarburization hindering measures are correctly employed, it is today possible to obtain an end product free of decarburization.

Fences are Fine

(*Continued from page* 345)

of community safety, fencing and related topics, that a community with good fences is neater and safer. They make for more orderliness and better protection of property and equipment. They are a practical investment. A wire fence, erected temporarily to surround construction equipment to keep it from children, aroused interest too.

* * *

These children, because of their keen interest in fencing, its uses and its need, have become some of the fencing industry's best customers of tomorrow. While progressive education wants children to feel "free", it never once allows them to feel neglected, as far as good wire fencing is concerned.

Catalog on Diamond Tools and Powders

Diamond Tool Research Co., 380 2nd Ave., New York 10, N. Y., has issued a product and price catalog, No. A 60, in which are pictured and described the firm's complete line.

* * *

Products covered are diamond grits and powders, dressing tools, thread and gear grinding dressers, wheels, mandrels, premixed diamond compounds, diamond reclaiming, and many other products and services.

* * *

Catalog No. A 60, comprised of loose bulletins on different categories of products, is contained in a folder suitable for filing. The catalog is available upon request to the company.

OUR ADVERTISERS ARE RELIABLE PATRONIZE THEM

Six *advantages from just* One *dip!*

and ONE DIP *is all that is necessary for coating wire and steel rods . . .*

good acid neutralizing

faster butt welding

better working conditions

longer storage with safety

rust inhibitor coating

longer die life

you get them all with . . .

BORAX 5 MOL.

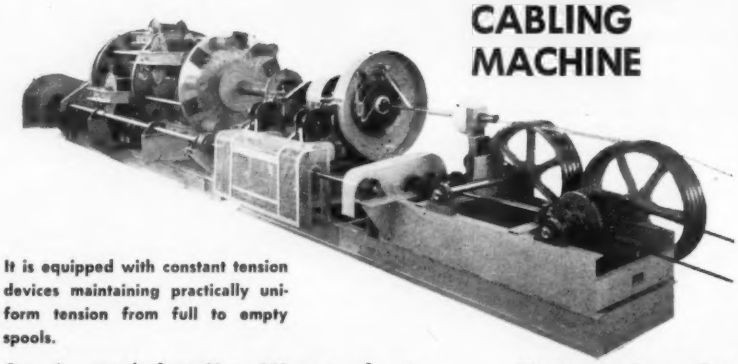
BORAX 5 MOL offers worthwhile advantages over regular borax as a satisfactory coating material on ferrous rods and wire in preparation for dry drawing. This newer material offers a higher concentration of sodium borate and therefore savings may be realized through reduced transportation, handling, and storage costs. Only about three-fourths as much Borax 5 Mol need be used to equal regular borax . . . yet you get the same worthwhile results!

Write to our Technical Department for further information

U.S. BORAX

50 Rockefeller Plaza, New York 20, N. Y.
630 Shatto Place, Los Angeles 5, Calif.

PLANETARY CABLING MACHINE



This Machine Accommodates Reels Up To 24 Inches In Diameter And 16 Inches In Width.

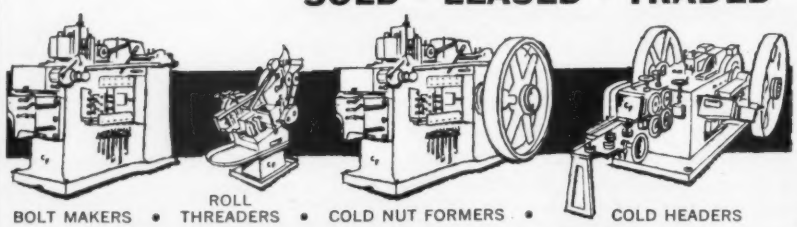
- It is equipped with constant tension devices maintaining practically uniform tension from full to empty spools.
- Operating speeds from 80 to 100 r.p.m. of rotor.
- Power can be supplied either by an induction motor, Warner clutch, and Vee belt drive, or a wound rotor motor, resistors, and Vee belt drive.
- Filling Head for 6, 12, or 18 packages can be supplied.
- Binding Head accommodates four yarn packages 6 inches diameter, 4 inches traverse and is driven through a clutch, counter shaft, and variable speed device.
- The Taping Head accommodates a pad 18 inches in diameter, 1½ inches in width and is driven through a clutch, counter shaft, and variable speed device.
- Capstans are dual 4 groove 36 inches diameter, driven through change gears.
- This Planetary Cabling Machine is one of a number which we have built handling reels 8, 10, 12, 16, 19, 24, or 30 inches in diameter. We can supply standard units to meet practically all requirements.

WRITE, WIRE, OR PHONE FOR FURTHER INFORMATION.

THE EDMANDS CO. 860 WELLINGTON AVE. CRANSTON 10, R.I.

NEW! COLD HEADERS ✓ ROLL THREADERS ✓ COLD NUT FORMERS ✓ BOLT MAKERS ✓

SOLD • LEASED • TRADED



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CFM *cold forging machines inc.*

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- WIRE WORKING
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- WOOD SCREW
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- SPRING COILING
- PAPER STAPLE
- WIRE STRAIGHTENING
- TUMBLING BARREL
- WIRE AND TAPE
- NICKEL PLATING
- WIRE STRANDING
- ENAMEL COATING
- TRIMMING

Wire Kinks

(*Continued from Page* 343)

"At no time was there any attempt made to produce the sleeve independently and then to insert it over the article to be covered, but rather the article was inserted frequently in the machine and while still in continuous form each end would be sealed so that as it was released from the machine there was no opportunity for unraveling.

* * *

"Machines to cover wire bottles would undoubtedly have to be built to order, and I believe one of the larger braiding machine manufacturers might be in a position to supply a special machine for this operation."

ANSWER NO. 2

"It is difficult to answer the question raised in your letter. We know that braided wire sleeving is produced and later slipped on to flexible metallic tubing, but whether sleeving could be made and then slipped over a bottle to conform to the shape of the bottle is problematical.

* * *

"It is the tendency of braided wire sleeving to spread at the one end — the end that has been last braided — but the amount of the spread depends upon how tightly the sleeving has been braided, the characteristics of the wire used in the braid, the number of ends of wire braided per carrier and the very nature of the braid itself. It would be our suggestion that the sleeving be braided in long, continuous lengths, cut to the proper length, immediately applied to the bottle and fastened top and bottom.

* * *

"We suggest that the braid problem be presented to the National-Standard Co., Niles Michigan, Attention of Mr. R. W. Elder. The National-Standard Co. does custom braiding and might be interested in doing some experimental braiding to see what can be done, if the project is worth while."

THE 1961 BUYERS' GUIDE
Have you ordered your copy?
Price: $5.00

Crescent Company Plans New Plant

Through the purchase of a 38-acre tract of land in nearby Lincoln, the **Crescent Company, Inc.** of Pawtucket, R. I. and its **Carol Cable Division,** has taken the first step toward the construction of a 250,000-square-foot modern one-story plant for the manufacture of its insulated wire and cable. Announcement of the purchase was made by **Milton C. Sapinsley,** Board Chairman, and **John M. Sapinsley,** President, who said that the addition of the new plant to the Crescent and Carol manufacturing facilities is necessary for the continuing growth of the company. The new plant, when completed, will insure more efficient and more economical manufacturing operations than is possible in the company's present plant in Pawtucket, although this plant will not be vacated.

* * *

The building site, acquired in cooperation with the Rhode Island State Development Council and the Lincoln Industrial Commission, is located on George Washington Highway at Great Road in Lincoln near Pawtucket. The property is near a proposed new highway and in an area for which industrial park development is forecast.

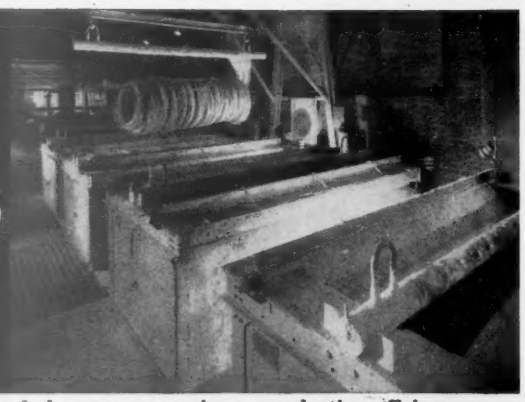
* * *

The Crescent Company, founded in 1916, has been in the wire and cable business since 1924 and produces a complete line of automotive wire and cable products. The Carol Cable Division manufactures a broad line of wire and cable for industry.

* * *

Earlier this year, in an initial step in expanding its management personnel, Crescent elected two new vice presidents and advanced other top-level accounting and production executives. **Kenneth R. MacLean,** formerly General Sales Manager of the Automotive, Industrial, and Electrical Divisions, was named Vice President — Sales. **Louis F. Palana,** who served in a succession of supervisory positions in manufacturing since joining the company in 1936, was elected Vice

carl mayer
HI-SPEED REGISTERED
ROD BAKERS



Faster baking, greater fuel economy, maximum production efficiency are just a few of the results of the exclusive heating arrangement of the Carl Mayer Hi-Speed Rod Baker. It also has a patented blow-off feature which removes moisture without damage to coils.

Here are just a few of our many satisfied customers:

American Steel & Wire Co.
Atlas Steel Co.
Colorado Fuel & Iron Corp.
Crucible Steel Co. of America
Driver-Harris Co.
B. Greening Wire Co., Ltd.
Indiana Steel & Wire Co.
Jones & Laughlin Steel Corp.
Republic Steel Corp.
Sheffield Steel Div., Armco Steel Corp.
Steel Company of Canada

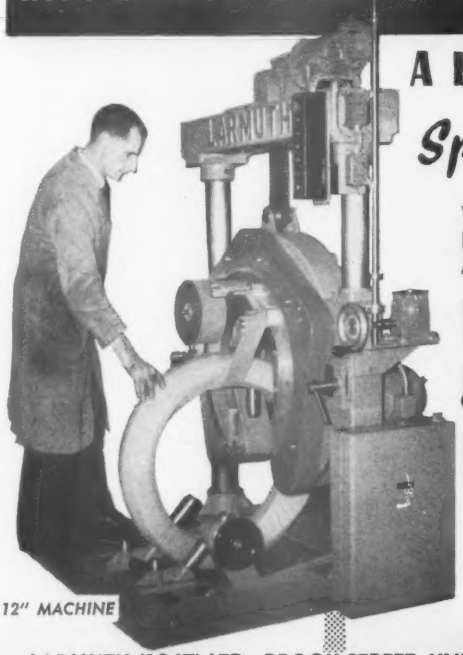
WRITE FOR BULLETIN NO. 350

Patent Nos.
U. S. A. 2,296,361
2,323,828
2,235,559
Canada 396,144
401,589

THE carl mayer CORP.
20800 CENTER RIDGE RD., CLEVELAND 16, OHIO
OTHER PRODUCTS: Core Ovens • Mold Ovens • Welding Rod Ovens • Heat Treating Ovens & Furnaces • Special Processing Equipment and Accessories.

HEAVY COIL WRAPPING MADE EASY WITH LARMUTH'S NEW 12" MACHINE

Now Glues The Paper As It Wraps



12" MACHINE

A LARMUTH Spiral Wrapping MACHINE

WITH PATENT MECHANICAL LOADING AND EJECTION

FOR COILS UP TO 12" WIDE

PUSH BUTTON CONTROLLED

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PRODUCERS OF QUALITY FINE WIRE
COPPER CONDUCTORS

SOLID • BUNCHED
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BARE • TIN OR
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RACKS

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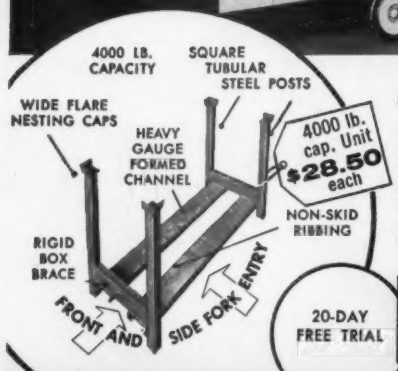

Solve Wire Coil Storage Problems

Makes handling and storing of unwieldy wire coils a simple one-man operation. Improves plant housekeeping, saves space, provides positive inventory control. Front and side fork entry permits closer stacking and greater maneuverability in narrow aisles. Saves time, labor, cuts costs. Standard and special sizes.

20-DAY FREE TRIAL

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Send for Details
6333 Howard St.
Chicago 48, Illinois

MODULAR STORAGE SYSTEMS FOR METAL INDUSTRY • STEELMOBILE

President — Operations. **David J. Murphy** was appointed Controller; and **William E. Ethier** became General Foreman.

Continuous Dry Blend Mixing Process for Polyvinyl Chloride Compound

(*Continued from page* 349)

ration of the base mix. Following a definite mixing time, the pigmented compound is discharged from the bottom of this kettle into the intermediate storage tank below.

* * *

The handling of the mixed compound comprises the final step of this process. The mixed colored compound, which is discharged from the mixing unit, drops by gravity into intermediate storage tanks beneath the mixers. The Baltimore installation uses tanks in this position and each tank contains up to 500 pounds of completely mixed colored material. There is one tank assigned to each colored compound, which gives storage capacity equal to one hour's output of the mixing unit. This gives some flexibility between the mixing system and the extruder so that short shutdowns for minor repairs or adjustments to the mixing system will not interrupt the extruder operation.

* * *

The compound handling system of the process is completely automatic. A vacuum pump draws the compound from the intermediate storage tanks through pipes to a cyclone type separator. A special feed nozzle at the base of each storage tank is used to fluidize the mixed compound as it enters the air conveyor. The mixed compound trapped in the cyclone separator drops by gravity into a receiver hopper. Down spouts are attached to the receiver hopper and extend to one or more extruder hoppers. Level indicators in the hopper over each extruder activate a valve and allow compound to feed by gravity from the receiver hopper.

* * *

A similar air conveying system is used to deliver PVC resin from the storage bin to the resin hopper above the resin weighing position.

* * *

Units of this type have been in successful operation at the Baltimore Works of the Western Electric Company, sixteen hours daily for approximately ten years. This type of mixer is suitable for continuous mixing of PVC compounds in large quantities. Considering the past decade of rapid change and progress, it is truly remarkable that an engineering idea brought to reality some ten years ago is still unique in industry.

Copyright Western Electric Engineer 1960.

150,000 Volt AC Test Set

Meeting military and ASTM standards for Dielectric testing as well as corona testing, this corona-free, castor-mounted mobile unit provides 150,000 volts rms at full 15 KVA capacity in a relatively small and convenient package.

* * *

Other features include low waveform distortion below 5%, an oil-filled corona-free bushing; surge protected high-voltage transformer ruggedly designed for testing service, accurate output voltage metering thru built-in oil immersed metering circuit at ground potential, and built-in corona pick up network terminated in a coaxial connector for feeding an external corona detector.

* * *

The unit, measuring 34″ x 34″ x 86″ high, may be purchased separately, or with a complete set of controls for convenient and safe testing. As a straight Dielectric Test Set the model designation is K150-15 as a combination Corona Test and Dielectric Test Set it is designated as CT150-15.

* * *

Applications include corona and dielectric strength testing of HV bushings, insulators, transformers, cables, and insulating materials in general. Other sizes made to order.

* * *

For data sheet giving full details, write Peschel Electronics, Inc., Towners, Patterson, N. Y.

New Booklet on Silicones

A new and comprehensive booklet on silicones containing the most

Établissements

VICTOR LINÉ

of Albert (Somme) France

Originators Of The Famous LINÉ-GORCY Rod Descalers

(Over 2000 now operating in 28 countries of the world)

Proudly Announce

Their

NEW DC-1-A & DC-2-A

MECHANICAL ROD *DESCALERS*

For Cleaning Hot Rolled Wire Rods
up to 5/8-inch Diameter incl.

New Features —

Lubrication of *Bearings*—permanent—sealed

Increased efficiency—Motor driven brushes

Newly designed hard-faced *Roller* units

Easier *Threading* and easier *Maintenance*

With these Superior Machines
MECHANICAL DESCALING of WIRE RODS
—Takes a Giant Step Forward

Write to: FISHER ASSOCIATES 122 E. 42nd St., New York 17, N. Y.

WITHSTANDS HI-SPEED PRESSURE OF SYNTHETIC YARNS AND WIRE WITHOUT WEAR OR DAMAGE

HEANIUM®
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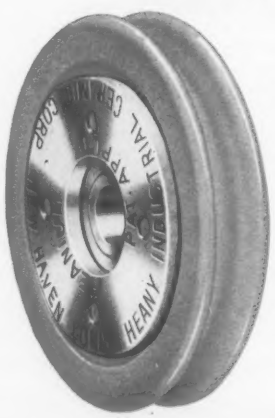
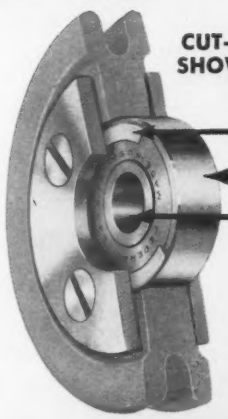
CAN BE RUN AT TEMPERATURES ABOVE 200 F. WITHOUT BEARINGS LOOSENING IN PULLEY.





CUT-A-WAY SECTION SHOWING ASSEMBLY

FORMED TENSION SPRING

BEARING FEDERAL 9433 FF

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Diameter of Pulley 2″

Heanium® Pulleys outwear their bearings, but the bearings are easily replaced.

If guide wear is a problem in your mill . . USE **HEANIUM®**

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recent and advanced information on these important man-made chemicals has just been issued by the **Silicones Division** of **Union Carbide Corporation** as an aid to engineers and technical personnel.

* * *

Graphically illustrated with photographs, charts and graphs, the booklet goes into detail about what silicones are, describes their manifold uses for consumer and industrial products, and suggests ways in which they can be adapted to a host of new applications by the design engineer or product development manager. Of special significance is the series of charts covering the properties and features of Union Carbide Silicone fluids, resins, rubber compounds, water repellents, anti-foams and emulsions, and their adaptability for use by the aviation, automotive, chemical, electronic, rubber, paint, paper, textile, glass, metal working and other industries.

* * *

The booklet is free and can be obtained by writing to Silicones Div., Union Carbide Corp., 270 Park Ave., New York 17, N. Y.

Sunbeam Appoints Representative

Sunbeam Equipment Corp., Meadville, Pa., has appointed **The Flarsheim Company,** 647 West 39th St., Kansas City 11, Mo., to represent the Sunbeam line of industrial heat treating furnaces and equipment in Western Missouri and Kansas.

Booklet on Chemical Cleaning

"Chemical Cleaning of Boilers, Auxiliaries and Heat Exchangers." 12-page technical booklet, including photographic evidence, discusses importance of chemical cleaning to efficient operation and extension of useful service life of much power plant operating equipment. **Dow Industrial Service,** 20575 Center Ridge Road, Cleveland 16, Ohio.

New PVC Homopolymer

Thompson Chemical Company, Pawtucket, R. I., has announced the commercial availability of Trulon 630. This new PVC homopolymer is a unique low molecular weight resin offering a new high in level of plasticizer absorption capacity. It also shows particularly good heat stability coupled with processing ease.

* * *

According to company spokesmen, Trulon 630 is already in commercial production and ready for immediate shipment.

Rapid Reversing Motors

Louis Allis Rapid Reversing Motors are available in a complete line of integral HP, polyphase ratings offered in Open Drip-Proof, Totally Enclosed Fan-Cooled and Non-Ventilated enclosures. These are also available in Blower-Cooled constructions that incorporate an integrally mounted blower to supply a continuous unidirectional supply of air for maximum cooling and reversing capacity.

* * *

They are primarily designed for high production Machine Tool applications, offering up to 125 idle reversals per minute in the smaller sizes with open type construction and can be built to exceed 200 idle reversals per minute with Blower Cooled designs.

* * *

The complete line of Rapid Reversing Motors features stator and rotor construction designed to reduce losses and give maximum reversals combined with long motor life. Stators are built with large specially shaped slots for maximum copper in windings. Rotors in the smaller sizes are cast aluminum with special slot design and low inertia construction, while larger sizes employ high resistance bar rotor construction with many special bar and end ring alloys used for optimum performance.

* * *

For complete information request Bulletin 1800 on Rapid Reversing motors from **The Louis Allis Co.,** 427 E. Stewart St., Dept. P, Milwaukee, Wisc., or contact your nearest Louis Allis District Office.

2 COMPANIES

Supplying the needs of the wire industry in the West

First, there's Western Wire & Textile Machinery, Inc., the only company in the West that deals exclusively in used and reconditioned wire and cable-making equipment.

Secondly, there's the Paul I. Kenner Co., supplier and distributor of new wire and cable manufacturing machinery and supplies.

Nowhere else in the West will you have a better chance of finding exactly what you need - - - either new or used. Nowhere else in the West will you be able to trade in old equipment on new. Nowhere in the West will you find such a complete stock of machinery, equipment and supplies.

You'll like dealing with men who speak your business language - - - with companies backed by 20 years of highly specialized experience.

SOME USED EQUIPMENT ON HAND:

Braiders, Taping Machines, Used Watson and N.E. Butt Bunchers, 7 & 19 Bobbin Tubular Stranders, Used Syncro 61 Bobbin Planetary Strander.

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Enameling Equipment — Extruders
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PAUL I. KENNER Company

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Two companies that provide all that's needed, new and used for the West's wire industry

Complete Adjustable Speed Drive Line

A new 6-page Bulletin 2900 outlines an extensive line of Adjustable Speed Drives made by **The Louis Allis Co.** for applications in the ¾ to 2500 HP drive range. The Bulletin describes four types of complete packaged adjustable speed drives and gives details on available ratings, speed ranges, type enclosures, associated controls and many standard and special modifications.

* * *

The line includes: "Adjusto-Spede" AC drives, for stepless, accurately controlled, adjustable speed over a 17:1 speed range in ratings from 1 to 100 HP, with larger ratings available in liquid-cooled types called "Magnetic Drives" featuring an 8 to 1 speed range in ratings up to 2500 HP; "Select-A-Spede" DC drives for adjustable speed performance over an 8 to 1 range and greater in ratings from ¾ to 400 HP; "Allispede" drives, an AC motor driven mechanical adjustable speed drive (disc and belt) for speed ranges of 8 to 1 in ratings from 1 to 20 HP. The Louis Allis Company, 427 E. Stewart St., Dept. P. Milwaukee, Wisc.

New Low-Shrinkage Teflon Tape

A leading U. S. cable manufacturer has successfully reduced reject rate of small diameter braid jacketed cable from 10% to less than 1% by employing new low-shrinkage Teflon (TFE resin) tape, a product of **Dixon Corporation** of Bristol, R. I.; pioneer developers of reinforced Teflon and custom fabricator of special shapes and forms in Teflon and Rulon.

* * *

Now specified on all small diameter cable produced by this manufacturer, the new improved Teflon tape is a regular skived tape with controlled low-shrinkage. According to Dixon Corporation, "Low Shrinkage" Teflon Tape will show no more than 2% change in any dimension when heated at 730°F for 15 minutes. This is especially important to wire manu-

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say NIEDERRHEIN

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low metalloid rods
open hearth from C 1005 – 1090
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inside diameters 20, 24, 26, 33½"
Compressed bundles of 3000 lbs now available on request.
Reliable delivery schedules at a fair price.

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1V18 Shuster Production Booster

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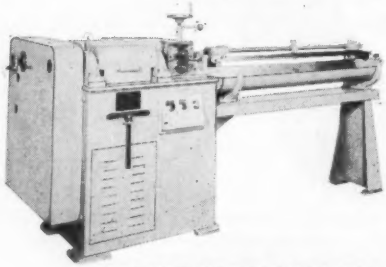

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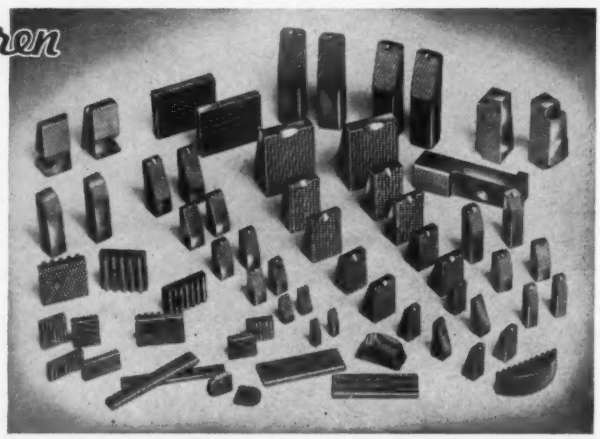

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Who Want the Best!

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facturers requiring insulating materials capable of withstanding prolonged exposure to high temperature without cracking or splitting . . . problems common to tapes with large or variable shrinkage characteristics.

* * *

"Low Shrinkage" Tape is available in thicknesses from 1 mil. up and widths from ¼" to 12". Tensile strength at .003" is 4000 psi minimum, and elongation 300% minimum. Dielectric strength is 2700 v/mil minimum. For complete details, write to Dixon Corporation, Bristol, R. I.

Autolite Announces Los Angeles Aircraft Wire and Cable Plant

A third wire and cable plant of the **Electric Autolite Company,** and its fourth West Coast facility, began supplying the aircraft and electronics industries on March 20, according to **J. M. Gerber,** general manager of the Toledo, Ohio, firm's wire and cable operations.

* * *

The 26,000 square foot facility at El Segundo, California, has been equipped with special wire drawing and braiding and coating process equipment. It has a capacity of 500,000 feet per day and employs approximately 45 persons.

* * *

The majority of production will be special wire and cable harnesses under contract to West Coast air frame and space vehicle builders and special assemblies for electronics manufacturers. Autolite has a number of development contracts and assignments for high temperature resistant coatings and insulations needed in high altitude or space flights.

Westwood Cable Expands Line

H. C. Harris, President of **Westwood Cable Corporation,** 3440 Overland Ave., Los Angeles 24, Calif., has announced expansion of its product lines, in revealing a new line of multi-colored ribbon cable, now being manufactured.

* * *

The new line is being marketed

under the trade name of Westrip, a parallel "band like" construction of plastic insulated wires.

* * *

According to **L. O. Seerden,** Sales Manager, the new type construction has advantages of space saving, ease of installation and low cost. The ribbon cable finds wide application in the electronics, missile, boat and trailer field. It is of special interest to firms in the audio field for monaural and stereophonic uses. The corporation plans to market the product nationally, and is in the process of appointing Sales Representatives throughout the United States on an exclusive basis.

* * *

Current production of Westrip is limited to ribbons up to one inch wide, or twenty conductors, and Sizes No. 28 through No. 10 AWG.

Revises Copper-Base Price Books

Numerous changes that have occurred in the pricing of copper-base alloys have been incorporated in the price book of **Riverside-Alloy Metal Division,** H. K. Porter Company, Inc. These include base prices and extra changes from October, 1960, to January 18, 1961.

* * *

Copies of the price book are available from Publications Section, Riverside-Alloy Metal Div., H. K. Porter Co., Inc., Riverside, N. J.

New Tool Component Booklet

Publication of a new technical booklet, "Tool Components and Their Applications," has been announced by **PIC Design Corp.,** subsidiary of Benrus Watch Co.

* * *

The 24-page booklet, the sixth in PIC's current series, was prepared to give the designer and engineer a clearer concept of standardized tool components and their varied applications. Case histories, citing specific examples, cover their use as standard parts for jigs, fixtures, tools and dies. The booklet points up the advantages and the savings effected in design and machine shop time, by the use of standardized tool components.

* * *

Copies of the booklet are available, without charge, from PIC Design Corp., 477 Atlantic Ave., East Rockaway, L. I., N. Y.

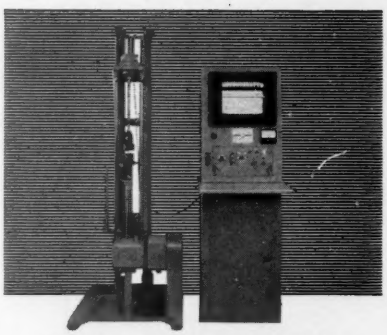
Wire Basket Bulletin

New 8-page bulletin B-10 on woven wire baskets for degreasing, dipping, heat treating, plating, pickling, ultrasonic or chemical cleaning, quenching and toting. Bulletin includes illustrations of all standard basket types and detailed specifications on the wire. For a copy write to **Newark Wire Cloth Company,** 351 Verona Ave., Newark 4, N. J.

Reynolds Metals Appoints Distributor

Pacemaker Steel and Aluminum Co., 1602 Lincoln Ave., Utica 4, N. Y., has been appointed a distributor of Reynolds aluminum products.

* * *



TENSILE TEST CAPACITIES TO 2000 LBS.

Scott Model J-5 Tester with ACCR-O-METER Electronic Weighing gives you a far greater range of quality evaluation for wire, insulation sheath, and cable components — and at modest cost! ACCR-O-METER strain gage weighing features *interchangeable* force dividers . . . provides for full scale test capacities of .5 to 2000 lbs. Push-button testing for both high and low elongation materials. Stress-strain information "picturized" on strip chart. Ample magnification for detailed test analyses. For top testing convenience, economy, versatility . . . get facts on ACCR-O-METER. **Scott Testers, Inc., 55 Blackstone St., Providence, R. I. Tel: DExter 1-5650 (Area Code 401).**

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SMOOTH SPOOL HEADS will not break, warp, knick or rough-up—reducing maintenance costs. The instant locking feature saves time locating "dog-hole". Lighter than metal spools with less wear on Braider and Winder.

Contact us regarding your Spool Problems.

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F. E. Romano, president of Pacemaker, said his firm will distribute Reynolds aluminum sheet, plate, extrusions, wire, rod, bar and other products in the central New York State area, which includes the cities of Syracuse, Albany, Elmira, Binghamton, Rome, Troy, Oswego, and Schenectady and their surrounding areas.

New Specs for Aluminum Chain Link Fencing

A Federal specification, issued recently by the U. S. Navy Bureau of Yards and Docks, is opening a host of governmental and military markets for aluminum chain link fencing.

* * *

John B. O'Donnell, manager of highway product sales for Aluminum Company of America, viewed the development as "a major advance for aluminum in the chain link fencing market." This is the first time the product has been issued a government specification number.

* * *

The specification, MIL-F-22709 (DOCKS), applies to all Federal Government procurement agencies, both military and civilian. In combination, they are the nation's largest buyers of chain link fencing.

* * *

Aluminum chain link fence fabric is superior to that previously used because of improvements in the tensile strength. It is now available in all 50 states, and while it commands a small premium over other types of chain link fencing, the extra costs are offset in maintenance, corrosion resistance and ease of erection.

* * *

Copies of the specification may be obtained by writing **Aluminum Company of America,** 779 Alcoa Building, Pittsburgh 19, Pa.

Hatfield Opens New Plant

The Hatfield Wire and Cable Division of Continental Copper and Steel Industries, Inc., has announced that its new Linden, N. J., rubber insulating plant—most modern facility of its kind in the country—is now in commercial production of high voltage (up to 15 KV) multi-conductor power cables, control cables, special industrial power cords, and a wide range of other cable types, not previously manufactured by the company, for utilities and other heavy industrial uses.

* * *

Representing a major expansion into new markets for the Hatfield Division—which for many years has been one of the country's largest suppliers of building wire and cable—the new high voltage cables are being made available through the company's sales and distributor organization.

* * *

The newest cable-making and testing equipment—designed to insure the most accurate in-process quality control and complete production flexibility to meet customer's needs for special designs and power requirements—has been installed at the 300,000 square foot Linden plant. The facility, completed in 1960, combines a rub-

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4 Wardwell, Type C, 4-Pad Paper taping Machines
Wardwell Braiders, 16 Carrier
48" Standard Davis Dual Capstan
Syncro, Type C, Intermediate Wire Drawing Machine, Complete.
3 Sleeper-Hartley BX Armoring Machines, Complete
2 – 24" New England Butt Bunching Machines, Complete
Many Other Items

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ber-making mill and an insulating plant for start-to-finish production of rubber insulated wire and cable of all types.

High Purity Anodes For Plating

Tin-lead solder anodes of virgin metal free of "sludge" deposits are virtually eliminated. They now are available from **Alpha Metals, Inc.,** Jersey City, N. J. Impurities are limited to as little as .02% of bismuth, antimony, etc.

* * *

Designed for plating electronic components and printed circuits, the anodes are available in extruded form. As a result, they corrode more evenly than the cast type.

* * *

Alpha anodes are available in 3 shapes: round, elliptical and flat. Each shape is for use with any of a wide variety of reusable hooks or cast copper hooks solder-coated and bonded to the anode stock.

* * *

For price quotations, submit specifications, describing the desired anode's width, thickness, length, whether to be drilled and tapped to receive a reusable hook or whether a bonded hook of a special shape is wanted. Send the information to Alpha Metals, Inc., 56 Water St., Jersey City 4, N. J.

Electronic Devices Important in Defense

The Department of Defense is becoming increasingly dependent upon electronic devices for analyses and computations and, perhaps in the near future, aid in making tactical decisions.

* * *

This view of the importance of machines in supplementing human capabilities was presented recently in Washington at a conference of key military personnel and wire manufacturers by **Colonel William R. Sturges, Jr.,** USAF, Assistant Director, Policy and Planning Division, Advanced Research Projects Agency, Department of Defense.

* * *

The conference was sponsored by the High Temperature Insulated Wire Section of the **National Electrical Manufacturers Association,** a $35,000,000 industry. Seventy-five percent of this industry's production goes into missile and satellite wiring systems and other electronic defense needs. Because most of its sales are in the defense area, the Section asked for closer cooperation between NEMA and government agencies in research and development.

* * *

Colonel Sturges' talk emphasized wire as "the central thread in a vast listing" of complicated electrical applications, pointing up the many problems that lie ahead in the area of military requirements. Among such problems he included "ballistic missile defense" as "one of the biggest worries" facing the Defense Department. He said that "Until the age of transmission of power without wires is reached, you gentlemen have a lot of work ahead for you."

* * *

FINE NON-FERROUS WIRES
COPPER – OFHC – CADMIUM COPPER
BARE – SILVER COATED – SINGLE OR STRANDED. ALSO ALUMINUM.

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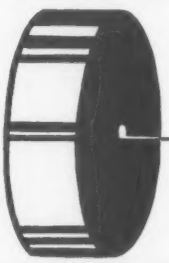

FOR WET DRAWING AND CLEANING COMPOUNDS
SPECIFY
PERMAG

For more than 33 years, Magnuson Products Corporation has helped solve difficult wire drawing and cleaning problems at considerable savings.

Write, wire or phone today and find out how Magnuson can help you expedite production.

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PRECISION WOUND ON WARDWELL TUBES AND NEW ENGLAND BUTT TUBES

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Spot lots always in stock

The challenge of assisting with present and future problems was accepted by the manufacturers with the added suggestion that government agencies avail themselves of the cooperation and talents offered to them through industry trade organizations in solving their technical problems.

Booklet on Maintenance

A new 16-page picture booklet, presenting helpful facts about making maintenance and repair parts, has just been made available by **La Salle Steel Company.**

* * *

The booklet, entitled "One Way to Make Your Job A Little Easier," will be of particular interest to maintenance executives, engineers and other key maintenance personnel. It offers solutions for those persons faced with the problem of getting machinery repaired and back into production fast, and at minimum cost. It will also prove helpful to designers, production and research men who must make any kind of special machinery or equipment requiring machine parts.

* * *

Included in the booklet are physical properties, chemistry and tolerances for Stressproof Steel Bars, widely used in both production and maintenance and parts applications.

* * *

Free copies may be obtained by writing **W. E. Schneider,** La Salle Steel Company, P. O. Box 6800-A, Chicago 80, Ill. Ask for Bulletin No. 24.

Cash Awards for Copper Users

Using copper in a new or better way? If so, your idea should be competing for top honors in the 1961 Copper and Brass Achievement Awards program now in progress. In the current, third annual contest to encourage and reward outstanding developments in the use of copper and its alloys, two $500 first prizes will be given, one in an industrial category, the other in architecture. Entries must be submitted no later than March 31.

* * *

Entries for the industrial award can be new products or components for industrial or consumer use, metallurgical developments, promotion or marketing programs, improved fabricating techniques, or new concepts for established applications of copper, brass, or bronze. In the architectural category, entries can include designs for residential, commercial, or other buildings, engineering concepts, and other original applications of the copper metals in building construction.

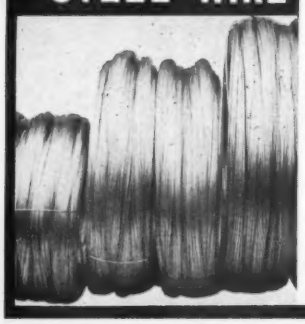
* * *

Entry forms with full details are available from the Copper & Brass Research Association, 420 Lexington Ave., New York 17, N. Y.

Chase Forms Rhenium Division

Chase Brass & Copper Co., a division of **Kennecott Copper Corp.,** has announced the forma-

STAINLESS STEEL WIRE



Holds World's record for Productivity & Export

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STAINLESS STEEL WIRE

Dia: 0.625"~0.0016"

Capacity: 350 tons(monthly)

NIPPON STAINLESS STEEL WIRE MFG. CO., LTD.
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DIES and NOZZLES for INSULATING ELECTRIC WIRE

STEEL and CARBIDE

CENTRAL CARBIDE NOZZLES OR TIPS have extremely long life and cut costs.

Our STEEL DIES are made Round, Figure 8, Serrated, Tracer—or in special shapes.

Highest quality of workmanship and materials. Semi-Finished Standard dies and TIPS in stock. Special shapes to specification.
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MUSIC WIRE and SPECIAL WIRES

Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .250"
45 sizes Bright Tinned, .005 to .125"
Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
Coppered Steel Spring—Galvanized—Tinned
Monel—Nickel Silver—Pure Soft Nickel—Oil Tempered, Steel Spring, Black Finish
Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
Hoskins Chromel "A"—Stainless, Soft and Spring Temper—Tag Wire, 1000
in an Envelope—Florist Wire—Spooled and Coiled, ¼-½-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.
Dental and Surgical Wires, large assortment.

THE MALIN & COMPANY

2514 Vestry Ave. Established in 1884 Cleveland 13, Ohio

tion of a **Rhenium Division. John H. Port** has been appointed manager of the new division.

* * *

Rhenium has wide application in the electronics, electrical, and aerospace fields. A precious metal, it has a very high melting point (5756 degrees F) and excellent electrical and mechanical properties, even at elevated temperatures. Only one other metal, tungsten, has a higher melting point.

* * *

The first American commercial production of wrought rhenium rod, wire and strip was announced by Chase in January of 1959. Chase rhenium sales have increased approximately 400 per cent over the past four years. According to Mr. Port, the demand is still growing for this exotic metal.

AWS Bibliographies for 1960

The American Welding Society has announced the publication of the 1960 Supplement to the AWS Bibliographies. The original publication contained bibliographies of articles which appeared in the Welding Journal from 1937 through 1957 and each year a Supplement is compiled listing the previous year's articles.

* * *

The Bibliographies previously issued listed articles under 28 subject headings. The current Supplement contains listings of all articles appearing in the Welding Journal from January through December, 1960. The complete Bibliographies thus provide a record of all articles on welding, welding research, and related subjects which have appeared in the Society's magazine from 1937 through 1960.

* * *

Copies of the 1960 Supplement to the AWS Bibliographies may be obtained at a cost of $1.50 from the American Welding Society, Technical Dept., 33 West 39th Street, New York 18, N. Y.

New Specialty Wire Firm Specializing in Clad Wires

A new metalworking company has commenced operations in Boston, Mass., bringing under one roof a wide background in the field of specialty metals and their application. The firm, **Metalonics Corporation,** employs a versatile 800-ton extrusion press and has acquired specialized equipment for drawing, coiling, cutting and straightening. Initial operations will be centered about the extrusion of high performance and clad metals in the form of rod and special shapes. Tubing is expected to be added at a later date.

* * *

According to **Norman R. Gardner,** President of the firm, they will seek to meet the need for a more rapid translation of new materials and design ideas into commercial products, making them available in production lots. Typical product lines will include titanium clad aluminum, copper clad aluminum, nickel clad copper and a wide range of composites. Specialty metals such as beryllium and zirconium will also be processed.

* * *

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Of First Quality Only

For assured quality, accurately graded diamond powders

Specify
"DANFORTH"

WE BUY SWARF, SLUDGE AND LAPPING COTTON

RECLAIMING SERVICE
We also reclaim and return to you the diamond content, guaranteed 99% pure and graded for further use.

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WANT GOOD WIRE? THEN USE "THE BEST" DIES!

Only top-quality DIAMONDS are used by WAYNE. This, plus perfection in workmanship, is responsible for the fine reputation of
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Satisfactory DIAMOND DIES can only be made by those who have experience, skill and knowledge. WAYNE has all of these. Users have called WAYNE DIES "the best."

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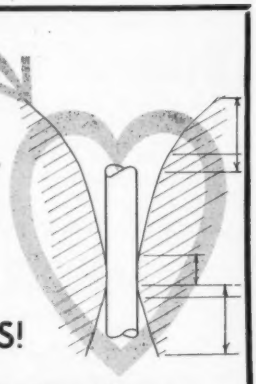
It's the "HEART" of the DIE that COUNTS!



Our Workmanship is Concentrated Here!

- On the shape and polish of the drawing angle.
- On the bearing and back relief. Because they are the only parts of the die that have direct contact with the wire and control the quality and quantity of wire you get per die.

We Don't Polish the Bell!

- Because it never contacts the wire.
- Because it adds nothing to the quality of the die.
- Because it disguises poor workmanship.
- Because a polished surface makes it almost impossible to hold the drawing angle during recutting operations.

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mounted unmounted
For Precision Wire Drawing
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Experts in Fine Size Diamond Dies
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and DIAMOND POWDER
INDIANA WIRE DIE COMPANY
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Phone: Harrison 4373

Houlder Hudgins, Professor of Industrial Management at M.I.T. is Chairman of the Board of Directors. He announced the following officials in addition to President Gardner: **Wells Morss** (formerly with Simplex Wire & Cable Co.) as Treasurer; **Milton J. Smith** (President of Trim Alloys, Inc.) as Senior Vice President; **Frank M. Yans** and **Alan D. Donaldson** as Vice Presidents. The latter two officers and the President, all formerly with Nuclear Metals, Inc., are engineering graduates of M.I.T. with extensive experience in the processing of specialty and clad metals.

* * *

The officers have been pleased with the initial trade reaction to their operations, and it seems apparent that this firm will fill a definite need in the metalworking industry both nationally and in New England.

DIAMOND WIRE DRAWING DIES
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Outstanding in quality,
workmanship and service.
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QUICK DELIVERIES ON
ASSEMBLED OR KNOCKED DOWN REELS
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STANDARD OIL BLDG. BALTIMORE 2, MD.

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Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

ABRASIVES— Shot & Grit, For Cleaning
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

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(See Inhibitors, Pickling)

ANNEALING MACHINES — Electric Resistance
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

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Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Plastic Mold & Engineering Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

BORAX—Wire Drawing
U. S. Borax, New York, N. Y.

BRAZERS—Electric for Wire
Steele Company, M. G., Rome, N. Y.

CABLE FILLERS—Paper
Twitchell, Inc., E. W., Philadelphia, Pa.

CAPSTANS—for Wire (also Caterpiller Types)
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Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Div. of Franklin Research and Development Corp., Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

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Amchem Products, Inc., Ambler, Pa.

CLEANERS—Metal
Apex Alkali Products Co., Phila., Pa.
Circle Chemical Co., Chicago, Ill.
Magnuson Products Corporation, Brooklyn, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Parkin Chemical Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Frankfort, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.
Wheelabrator Corporation, Mishawaka, Ind.
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH—WIRE, All Metals
Hudson Wire Co., Pequot Div., Norwalk, Conn.
Wickwire Bros., Cortland, N. Y.
Wisconsin Wire Works, Appleton, Wis.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Miller, R. H., Co., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
U. S. Borax, New York, N. Y.

COLOR CONCENTRATES—For Wire Coatings
Blane Corporation, The, Canton, Mass.

COMPOUNDS—Brazing
Steele Company, M. G., Rome, N. Y.

COMPOUNDS—Coppering
Amchem Products, Inc., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Alabama Wire Die Co., Fayette, Ala.
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

COMPOUNDS—Extrusion, for Wire
Amchem Products, Inc., Ambler, Pa.
Blane Corporation, The, Canton, Mass.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

COMPOUNDS—For Improving Drawing & Extrusion
Amchem Products, Inc., Ambler, Pa.

COMPOUNDS—Metal Finishing
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Phosphate Coating
Amchem Products, Inc., Ambler, Pa.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Rust Preventing
Amchem Products, Inc., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.
Circle Chemical Co., Chicago, Ill.

COMPOUNDS—Rust Removing
Amchem Products, Inc., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

COMPOUNDS—Vinyl
Blane Corporation, The, Canton, Mass.
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnuson Products Corp., Brooklyn, N. Y.
Miller, R. H. Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.
Swift & Company, Chicago, Ill.
U. S. Borax, New York, N. Y.

CONDUCTORS—Flexible, Electrical
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.

CONTAINERS—Wire Packaging
(See DRUMS—Wire Packaging)

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

COUNTERS—
(See MACHINERY—Measuring Wire and Cable)

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio
Morgan Construction Co., Worcester, Mass.

CUTTING TOOLS—Carbide
Eastern Carbide Corp., New Rochelle, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.

CUTTING TOOLS—Wire
Manco Mfg. Co., Bradley, Ill.
Robinson, M. W. Co., Rockville, Conn.

DIAMONDS—Industrial
Alabama Wire Die Co., Fayette, Ala.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Indiana Wire Die Co., Ft. Wayne, Ind.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y
Wayne Wire Die Co., Linden, N. J.

DIAMOND POWDERS—
Danforth Company, C.W., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Fort Wayne Diamond Products, Inc., Fort Wayne, Indiana
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
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Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Wayne Wire Die Co., Linden, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Cold Heading
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.

DIES—Diamond
Alabama Wire Die Co., Fayette, Ala.
Ajax Industrial Supplies, Inc., Ft. Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J. Inc., New York, N. Y.
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Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES DIAMOND—Controlled Drawing Angle
Hoosier Wire Die, Inc., Fort Wayne, Ind.

DIES DIAMOND—Reversible
National Wire Die Co., Inc., New York, N. Y.

DIES—Extrusion
Alabama Wire Die Co., Fayette, Ala.
Central Tool and Machine Co., Bridgeport, Conn.
Eastern Carbide Corp., New Rochelle, N. Y.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N.Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Fenn Manufacturing Co., Newington, Conn.
Sjogren Tool & Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Brenon, Inc., Nixon, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.

Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
National Wire Die Co., Inc., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Roux Wire Die Works, Inc., Oriskany, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Wayne Wire Die Co., Linden, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.

DIES—Swaging
Fenn Manufacturing Co., Newington, Conn.
Sjogren Tool & Mach. Co., Inc., Auburn, Mass.

DIES—Tinning
Roux Wire Die Works, Inc., Oriskany, N. Y.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Eastern Carbide Corp., New Rochelle, N. Y.
Hoosier Wire Die, Inc., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRIVES—Variable Speed
Allis Co., Louis, Milwaukee, Wisc.

DRUMS—Wire Packaging
Hubbard Spool Company, Div., Van Norman Industries, Inc., Garrett, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Company, Div., Van Norman Industries, Inc., Garrett, Ind.
Republic Steel Corp., Berger Div., Canton, Ohio

DRYING EQUIPMENT—
Carl Mayer Corp., The, Cleveland, Ohio

DUST COLLECTORS—Wet or Dry
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

ENGINEERS—Consulting
Badwen, William D., Wilton, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FOAM PRODUCING COMPOUNDS—
Amchem Products, Inc., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Annealing, Vacuum
American Laubscher Corporation, New York, N. Y.

FURNACES—Brazing
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Galvanizing Equipment
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Company, Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)
Wilson Lee Engr. Co., Cleveland, Ohio

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)

FURNACES—Salt Bath
Ajax Electric Company, Philadelphia, Pa.

FURNACES—Strand Annealing
Ajax Electric Company, Philadelphia, Pa.
Ofenbau Fritz, G.m.b.H. & Co., K. G., Hagen, (W. Germany)

GALVANIZING EQUIPMENT—(See MACHINERY—Galvanizing Wire)

GUIDES—For Wire
Alabama Wire Die Co., Fayette, Ala.
Heany Industrial Ceramic Corp., New Haven, Conn.
Indiana Wire Die Co., Fort Wayne, Ind.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool & Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INKS—Printing, for Insulated Wire
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Company, West Hanover, Mass.

INSULATING MATERIALS—
Blane Corporation, The, Canton, Mass.
Dow Corning Corporation, Midland, Mich.
General Electric Company, Insulating Materials Section, Schenectady, N. Y.
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

LACQUERNG SYSTEMS—See MACH.—Lacquering Electric Wire

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Standard Industrial Compounds Co., Frankfort, Ill.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINE CONTROLS—Electronic
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—Armoring (Cable, Wire, Hose)
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.

MACHINERY—Blast Cleaning
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.

MACHINERY—Bobbin Winders
Hanson & Edwards, Ltd., Warrington, England

MACHINERY—Bolt, Rivet, Screw, etc.
National Machinery Co., Tiffin, Ohio
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Braiding
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Wardwell Braiding Machine Co., Central Fall, R. I.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Brazers for Wire
Steele Company, M. G., Rome, N. Y.

MACHINERY—Bunching
Cook Mfg. Co., The, Paterson, N. J.
Edmands Company, The, Cranston, R. I.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Philadelphia, Pa.
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus K. A. Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Cable, Electric
Cook Mfg. Co., The, Paterson, N. J.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Division of Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans
(See Capstans and Machinery—Winding Wire)

MACHINERY—Centerless Grinding & Polishing
American Laubscher Corp., New York, N. Y.

MACHINERY—Chain Link Fence
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Chain Making
Steel & Wire Machinery Co., Cleveland, Ohio
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Closing Cable
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A. Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Coulter & MacKenzie Machine Co., Bridgeport, Conn.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Cold Forging
National Machinery Co., Tiffin, Ohio
Unitech Products, Inc., Hartford, Conn.

MACHINERY—Cold Heading
National Machinery Co., Tiffin, Ohio
REM Sales Incorporated, Subsidiary of The Robert E. Morris Co., West Hartford, Conn.
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Copper Wire Drawing
Cook Mfg. Co., The, Paterson, N. J.
Herborn Machinery Corporation, Hackensack, N. J.
Johnson Machinery Co., Elizabeth, N. J.
Morgardshammars Mek Verkstads A. B., Morgardshammar, Sweden
National Mach'y Exch., (Used), New York
Showa Machine Works, Ltd., Osaka, Japan
Steel & Wire Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.
Whitacre Corporation, Alhambra, California

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)
Eisler Engineering Company, Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Cutters, Hydraulic for Rod & Bar
Manco Mfg. Co., Bradley, Ill.

MACHINERY—Dead Block (Stationary Coiler)
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wells Company, Frank L., Kenosha, Wisc.
Whitacre Corporation, Alhambra, California
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Descaling Rod, Dry
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fisher Associates, New York, N. Y.
Herborn Machinery Corporation, Hackensack, N. J.
Pangborn Corporation, Hagerstown, Md.
Wheelabrator Corporation, Mishawaka, Ind.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Die Making
Alabama Wire Die Co., Fayette, Ala.
Boulin, Victor J., Inc., New York, N. Y.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metallurgical Products Dept. of General Electric Co., Detroit, Mich.
Sjogren Tool & Machine Co., Auburn, Mass.
Wayne Wire Die Co., Linden, N. J.

MACHINERY—Draw Benches
American Laubscher Corp., New York, N. Y.
Loma Machine Manufacturing Co., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Edging (See MACHINERY—Tandem Rolling and Edging Mills)

MACHINERY—Enameling
Acrometal Products, Inc., Minneapolis, Minn.
American Insulating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler Co., C. A., Cleveland, Ohio

MACHINERY—Extruding
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Johnson Machinery Co., Elizabeth, N. J.
Royle, John, & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Flat Wire
Fenn Manufacturing Co., Newington, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Mettler Machine Tool, Inc., New Haven, Conn.
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Torrington Mfg. Co., Torrington, Conn.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Forming Wire
National Mach'y Exch., (Used), New York, N. Y.
Steel & Wire Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Galvanizing Wire
Miyazaki Iron Works, Ltd., Osaka, Japan
Ofenbau Fritz G.m.b.H. & Co., K. G., Hagen, (W.-Germany)
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle Manufacturing Corporation, Providence, R. I.

MACHINERY—Insulating Wire
American Insulating Mach'y. Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Litzler Co., C. A., Cleveland, Ohio
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Insulation Testing (See MACHINERY—Spark Testing)

MACHINERY—Lacquering Electric Wire
Cook Mfg. Co., The, Paterson, N. J.
Litzler Co., C. A., Cleveland, Ohio

MACHINERY—Lock Washer
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Looms, Wire Weaving
EVG., Machinen & Stahl, A. G., Zurich, Switzerland

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wisc.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

MACHINERY—Measuring and Control—Coating
Davis-Standard, Div. of Franklin Research and Development Corp., Mystic, Conn.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Co., Tiffin, Ohio
National Mach'y Exch. (Used), N.Y., N.Y.
Wafios Machinery Corp., Hackensack, N. J.

MACHINERY—Packaging Wire
Advanced Wyrepak Co., Bridgeport, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California

MACHINERY—Patenting Wire
Ofenbau Fritz G.m.b.H. & Co., K. G., Hagen, (W.-Germany)
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Whitacre Corporation, Alhambra, California

MACHINERY—Pin & Pin Pointing
REM Sales Incorporated, Subsidiary of The Robert E. Morris Company, West Hartford, Conn.

MACHINERY—Plating
Bartell Machine Tool Corp., Rome, N. Y.
Universal Industrial Equipment Co., Secaucus, N. J.

MACHINERY—Pointing
Herborn Machinery Corporation, Hackensack, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch., (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Straus-Artys Corp., Great Neck, N. Y.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio

MACHINERY—Printing on Electric Wire
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

MACHINERY—Re-Spooling
Acrometal Products, Inc., Minneapolis, Minn.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Miyazaki Iron Works, Ltd., Osaka, Japan
National Mach'y Exch. (Used), New York, N. Y.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc., (used), Pawtucket, R. I.

MACHINERY—Rod Mill
Herborn Machinery Corporation, Hackensack, N. J.
Morgan Construction Co., Worcester, Mass.

MACHINERY—Rolling Mill
Fenn Manufacturing Co., Newington, Conn.
Loma Machine Manufacturing Co., New York, N. Y.
Morgan Construction Co., Worcester, Mass.
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Litzler Co., C. A., Cleveland, Ohio.
Royle, John & Sons, Paterson, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.
Wire & Textile Mach'y Inc., (used), Pawtucket, R. I.

MACHINERY—Serving
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Slitting Mills
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Steel Equipment Company, Cleveland, Ohio

MACHINERY—Special
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.

MACHINERY—Spring Making
National Mach'y Exch., (Used), New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Straightening & Cutting
American Laubscher Corp., New York, N. Y.
Johnson Machinery Co., Elizabeth, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Loma Machine Manufacturing Co., New York, N. Y.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N.Y.
Patterson, George C., Machine Co., Cleveland, Ohio
Steel & Wire Machinery Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wafios Machinery Corp., Hackensack, N. J.
Wells Company, Frank L., Kenosha, Wisc.

MACHINERY—Stranding
Bartell Machine Tool Corp., Rome, N. Y.
Hanson & Edwards, Ltd., Warrington, England
Haskell-Dawes Machine Co., Phila., Pa.
Johnson Machinery Co., Elizabeth, N. J.
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Superior Tool & Manufacturing Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Fenn Manufacturing Co., Newington, Conn.

MACHINERY—Tandem Rolling & Edging Mills
Fenn Manufacturing Co., Newington, Conn.
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.

MACHINERY—Take-Up and Pay-Out
Acrometal Products, Inc., Minneapolis, Minn.
Advanced Wyrepak Co., Inc., Bridgeport, Conn.
American Insulating Mach'y Co., Phila., Pa.
Bartell Machine Tool Corp., Rome, N. Y.
Colbourne Machine Company, Winsted, Conn.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Division of Franklin Research and Development Corporation, Mystic, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Fenn Manufacturing Co., Newington, Conn.
Johnson Machinery Co., Elizabeth, N. J.
Litzler Co., C. A., Cleveland, Ohio.
Miyazaki Iron Works, Ltd., Osaka, Japan
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.
Whitacre Corporation, Alhambra, California

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Pourtier Pere et Fils, Romainville (Seine) France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Thread Rolling
Mettler Machine Tool, Inc., New Haven, Conn.
Straus-Artys Corp., Great Neck, N. Y.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Tinning Wire
American Insuating Mach'y Co., Phila., Pa.
Cook Mfg. Co., The, Paterson, N. J.
Litzler Co., C. A., Cleveland, Ohio

Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)
Universal Industrial Equipment Co., Secaucus, N. J.
Whitacre Corporation, Alhambra, California

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

MACHINERY—Tube Mill, Cold Drawing
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., New York, N. Y.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N.J.
Edmands Company, The, Cranston, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.

MACHINERY—Used
Johnson Machinery Co., Elizabeth, N. J.
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.
Wire Machinery, Inc., Chicago, Ill.

MACHINERY—Variable Speed Drives
Allis Co., Louis, Milwaukee, Wisc.

MACHINERY—Welded Wire Mesh
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Sommer Products Company, Peoria, Ill.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot and Machinery—Welding Wire Fabrics)

MACHINERY—Winding Wire
Davis Electric Co., Wallingford, Conn.
Davis-Standard Div. of Franklin Research and Development Corp., Mystic, Conn.
Emory Company, Robert J., Newark, N. J.
Enjaco Corporation, Cranston, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Miyazaki Iron Works, Ltd., Osaka, Japan
New England Butt Co., Division Wanskuck Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Standard Mill Supply Co., Pawtucket, R. I.
Steel Equipment Company, Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.

MACHINERY—Wire Drawing
American Laubscher Corporation, New York, N. Y.
Cook Manufacturing Co., The, Paterson, N.J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Fenn Manufacturing Co., Newington, Conn.
Herborn Machinery Corporation, Hackensack, N. J.
Johnson Machinery Co., Elizabeth, N. J.
Loma Machine Manufacturing Co., New York, N. Y.
Miyazaki Iron Works, Ltd., Osaka, Japan
Morgan Construction Co., Worcester, Mass.
Morgardshammars Mek Verkstads AB, Morgardshammar, Sweden
National Mach'y Exch. (Used), New York, N. Y.
Norton & Co., Ltd., Sir James Farmer, Manchester, England
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Showa Machine Works Ltd., Osaka, Japan
Societa Generale Delle Macchine Mill, Milan, Italy
Stanat Mfg. Co., Inc., Westbury, L. I., N. Y.
Steel Wire and Machinery Co., Cleveland, Ohio
Straus-Artys Corp., Great Neck, N. Y.
Superior Tool & Machinery Company, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Mach'y Co., Cuyahoga Falls, Ohio
Watkins & Sons, Inc., R. S., Sandy Hook, Conn.
Whitacre Corporation, Alhambra, California
Wire Machinery Inc., Chicago, Ill.

MACHINERY—Wire Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
American Laubscher Corp. New York, N. Y.
Larmuth (1947) Ltd., Cheshire, England

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio

MOTORS—Electric
Allis Co., Louis, Milwaukee, Wisc.

NAIL TOOLING—Tungsten Carbide
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.

NIPPERS—Wire Cutting
Robinson, M. W. Co., Rockfall, Conn.

NOZZLES—For Extruding Machines
Central Tool and Mach. Co., Bridgeport, Conn.

OVENS—Cable Lacquering and Enameling
American Insulating Mach'y Co., Phila., Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Colbourne Machine Co., Winsted, Conn.

OVENS—Rod Bakers
Carl Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl Mayer Corp., The, Cleveland, Ohio

PAILS—Packaging
(See Drums—Wire Packaging)

PAPER—Insulating
Twitchell, Inc., E. W., Philadelphia, Pa.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PLASTICIZERS—
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.

PLASTICS—for Wire Insulation
Blane Corporation, The, Canton, Mass.
Dow Corning Corporation, Midland, Mich.
Kenrich Petrochemicals, Inc., Maspeth, N. Y.
Monsanto Chemical Company, Plastics Division, Springfield, Mass.
Union Carbide Plastics Company, Div. of Union Carbide Corporation, New York, N. Y.
Union Carbide Corporation, Silicones Division, New York, N. Y.

PRINTING WHEELS—for Electric Wire
Daniels & Co., Frank, New York, N. Y.
Entwistle Manufacturing Corporation, Providence, R. I.
Gem Gravure Co., Inc., West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

PULLERS AND GRIPS—for Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool & Mach. Co., Auburn, Mass.

RACKS—Wire Storage
Jarke Manufacturing Co., Chicago, Illinois

REEL AND TENSION STANDS—
Acrometal Products, Inc., Minneapolis, Minn.
Mettler Machine Tool, Inc., New Haven, Conn.
Northern Indiana Steel Supply Co., Michigan City, Ind.
Standard Mill Supply Co., Pawtucket, R. I.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Republic Steel Corp., Berger Div., Canton, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

REELS—Plywood
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark Manufacturing Co., J. L., Rockford, Illinois
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Northern Indiana Steel Supply Co., Michigan City, Ind.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co. Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.
Nelson Co., The, Baltimore, Md.
Northern Indiana Steel Supply Co., Michigan City, Ind.
Republic Steel Corp., Berger Div., Canton, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wood
American Wood Working Co., Montello, Wisc.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Inc., Pine River, Minn.
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.
Nelson Co., The, Baltimore, Md.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio

RODS—Wire—Non-Ferrous
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Niederrheinische Huette, A. G., Duisburg, Germany
Sumitomo Metal Industries, Ltd., Osaka, Japan
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

ROPE—Wire
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons, Div., Colorado Fuel & Iron Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—RUST Removing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—RUST Preventing)

SILICONE RUBBER—For Wire Insulation
Dow Corning Corporation, Midland, Mich.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—For Retail Sale of Wire
American Wood Working Co., Montello, Wisc.
Clark Manufacturing Co., J. L., Rockford, Illinois

SPOOLS—Plastic
Hubbard Spool Company Div., Van Norman Industries, Inc., Garrett, Ind.

Plastic Mold & Eng. Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.

STAMPINGS—Steel
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

STOCK STORAGE SYSTEMS—
Jarke Manufacturing Co., Chicago, Illinois

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.

TANKS—Ceramic, for Galvanizing
Ofenbau Fritz G.m.b.H. & Co. K. G., Hagen, (W.-Germany)

TENSION METERS—for Wire
Boulin Instrument Corp., Pelham, N. Y.
Tensitron, Inc., Harvard, Mass.

TESTERS—INSULATION
(See Testing Equipment—for Dielectric Faults)

TESTING EQUIPMENT—Dielectric Faults in Insulation
Davis Electric Co., Wallingford, Conn.
Enjaco Corporation, Cranston, R. I.
Entwistle Manufacturing Corporation, Providence, R. I.
Federal Manufacturing Company, Wallingford, Conn.
Peschel Electronics, Inc., Patterson, N. Y.

TESTING EQUIPMENT—Physical
Scott Testers, Inc., Providence, R. I.
Steele Company, M. G., Rome, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper Silver and False Gold Coated, etc.
(See TINSEL-Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

TRANSMISSIONS—Variable Speed (See Adjustable Speed Drives)

TRAVERSE & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Davis Electric Co., Wallingford, Conn.
Emory Company, Robert J., Newark, N. J.
Western Wire & Textile Machinery, Inc., So. San Francisco, Calif.

VARNISHES & LACQUERS—for Electric Wire
General Electric Company, Insulating Materials Section, Schenectady, N. Y.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Division of Wanskuck Co., Attleboro, Mass.

WELDERS—Spot and Butt and Welding Wire Fabrics
Eisler Engineering Corp., Newark, N. J.
EVG, Maschinen and Stahl, A.G., Zurich, Switzerland
Herborn Machinery Corporation, Hackensack, N. J.
Micro Products Co., Chicago, Ill.
Sommers Products Company, Peoria, Ill.

WHEELS—for Printing on Electric Wire
Daniels & Co., Frank, New York, N. Y.
Gem Gravure Company, West Hanover, Mass.
Gillies, Duncan M., Co., Inc., West Boylston, Mass.

WIRE—Aluminum
Hudson Wire Co., Ossining, N. Y.
Malin & Co., The, Cleveland, Ohio

WIRE—Ball
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Barbed
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.

WIRE—Brake Lining
Hudson Wire Co., Ossining, N. Y.

WIRE—Brass and Bronze
Malin & Co., The, Cleveland, Ohio
Wisconsin Wire Works, Appleton, Wis.

WIRE—Brush
Hudson Wire Co., Ossining, N. Y.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.

WIRE—Bunched and Stranded
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.

WIRE—Cadmium
Stamford Processing Co., Peekskill, N. Y.

WIRE—Cold Heading
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Pittsburgh Steel Co., Pittsburgh, Pa.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Copper
Camden Wire Co., Camden, N. Y.
Hudson Wire Co., Ossining, N. Y.
Laribee Wire, Inc., Camden, N. Y.
Malin & Co., The, Cleveland, Ohio

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.

WIRE—Flat
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Montgomery Co., The, Windsor Locks, Conn.
Webb Wire Div. Carpenter Steel Co., New Brunswick, N. J.

WIRE—Galvanized
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Roebling's, John A. Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—High Carbon
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Detroit Steel Corporation, Detroit, Mich.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Manufacturers
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Berger Div., Canton, Ohio
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Rylands Brothers Limited, Warrington, England
U. S. Steel Corp., N. Y., N. Y.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Metalizing
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WIRE—Music
Malin & Co., The, Cleveland, Ohio

WIRE—Needle
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.

WIRE—Nickel Alloy
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Nickel Silver and Phosphor Bronze
Malin & Co., The, Cleveland, Ohio
Wisconsin Wire Works, Appleton, Wis.

WIRE—Oil Tempered
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Malin & Co., The, Cleveland, Ohio
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—for Prestressed Concrete
Rylands Brothers, Limited, Warrington, England

WIRE—Pin
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.

WIRE—Special Shapes
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Spring
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Keystone Steel & Wire Co., Peoria, Ill.
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Stainless Steel
American Chain & Cable Co., Page Steel & Wire Div., Monessen, Pa.
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Jones & Laughlin Steel Corp., Stainless and Strip Div., Detroit, Mich.
Malin & Co., The, Cleveland, Ohio
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Nippon Stainless Steel Wire Mfg. Co., Ltd., Osaka, Japan.
Pittsburgh Steel Co., Pittsburgh, Pa.
Webb Wire Div., Carpenter Steel Co., New Brunswick, N. J.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Steel—Also Coppered and Galvanized Steel
American Steel & Wire Div., United States Steel Corp., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Continental Steel Corp., Kokomo, Ind.
Detroit Steel Corporation, Detroit, Mich.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Malin & Co., The, Cleveland, Ohio
Maryland Fine & Specialty Wire Co., Inc., Cockeysville, Md.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Div., Colorado Fuel & Iron Corp., Trenton, N. J.
Rylands Brothers, Limited, Warrington, England
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Denver, Oakland & New York City.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Wisconsin Wire Works, Appleton, Wis.

WIRE—Stranded & Bunched
Hudson Wire Co., Ossining, N. Y.
Laribee Wire, Inc., Camden, N. Y.

WIRE—Tinned
Camden Wire Co., Camden, N. Y.
Laribee Wire, Inc., Camden, N. Y.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.
Stamford Processing Co., Peekskill, N. Y.

WOOD—for Guide Rolls, Bushings, Wear Parts, etc.
American Wood Working Co., Montello, Wisc.

WRAPPING PAPER—Creped
(See PAPER-Creped Wrapping)

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

YARNS—Wire Insulating
Chadwick Yarn Company, Pawtucket, R. I.
Synthetic Thread Co., Bethlehem, Pa.

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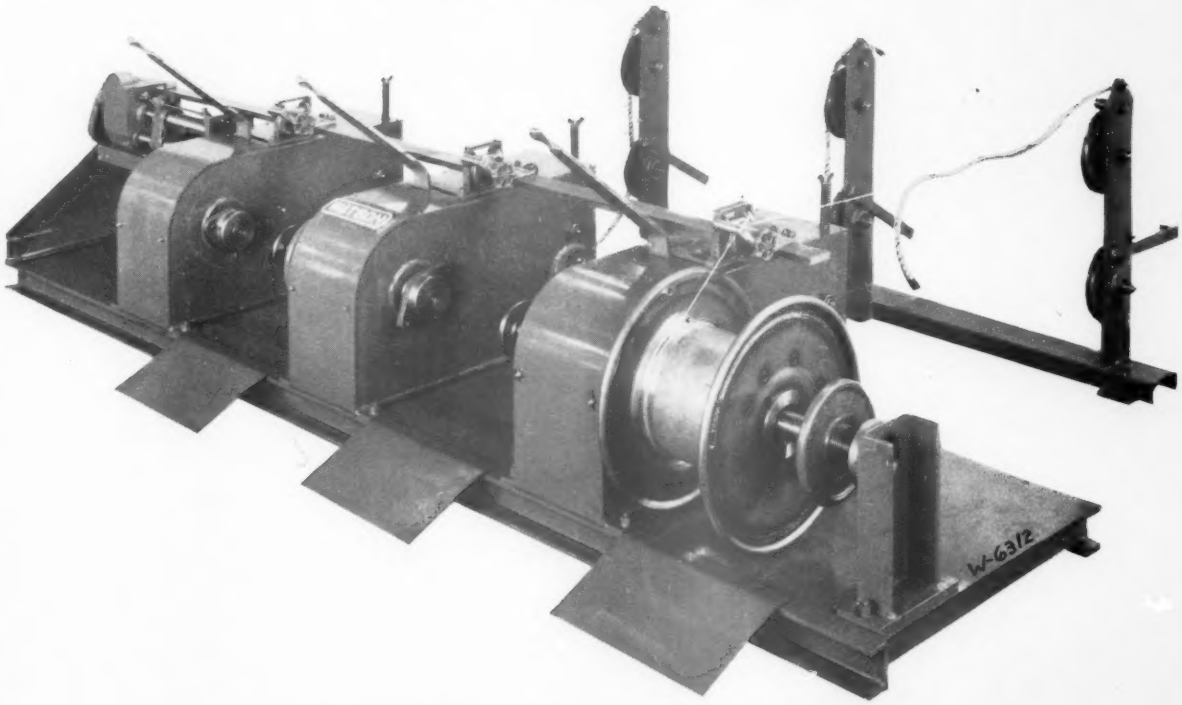

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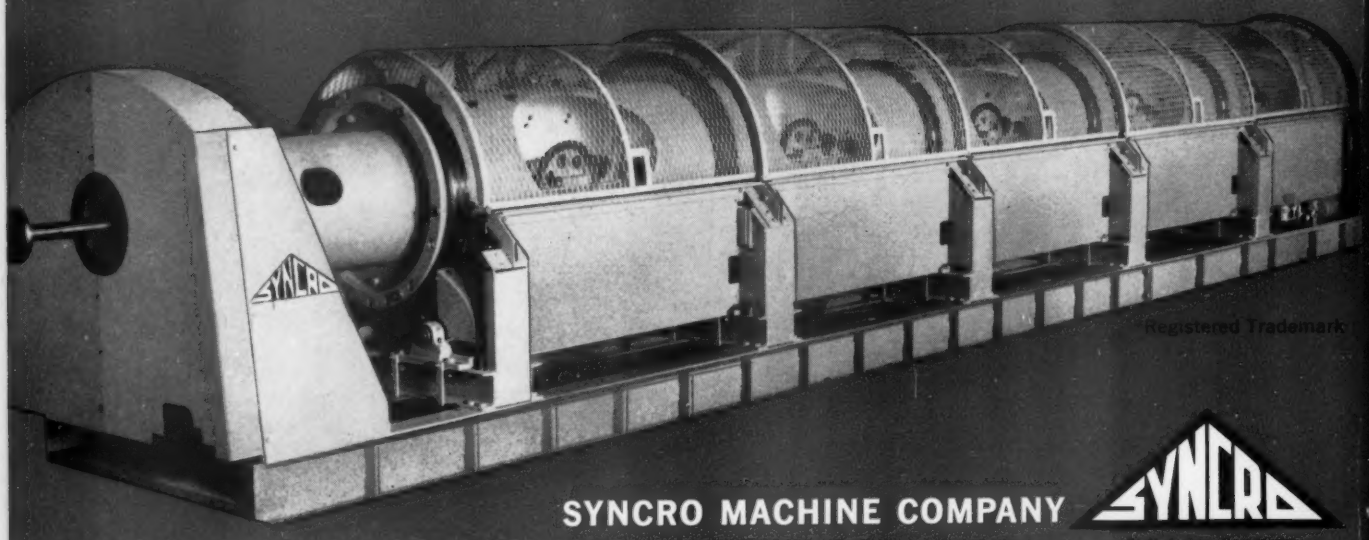

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